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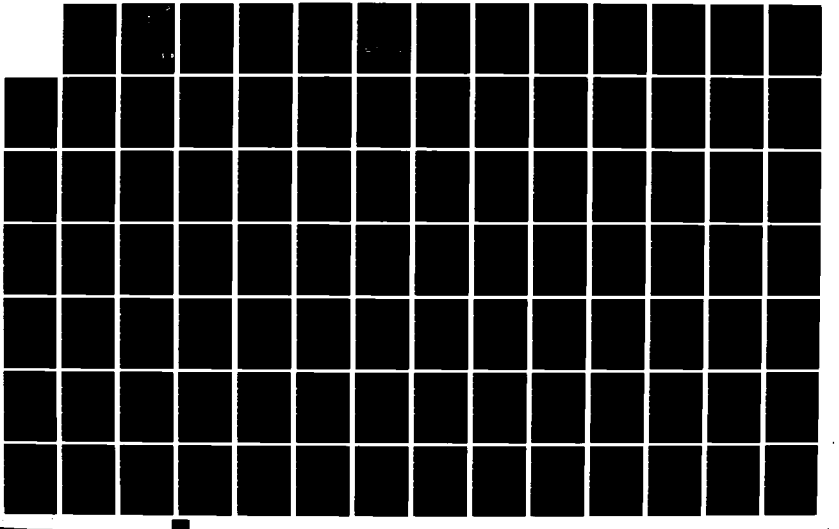

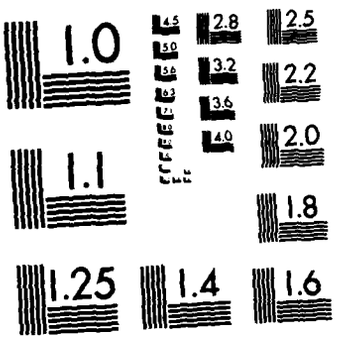

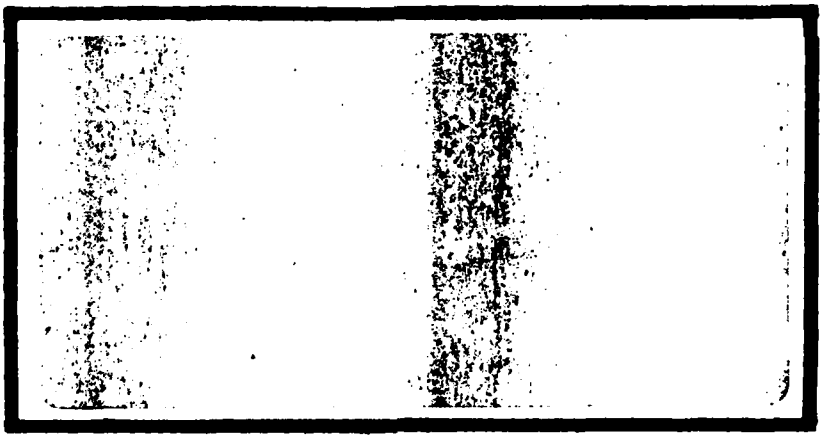

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY (ATC)

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AN EXPLORATORY ANALYSIS OF FMS DELIVERY DATA TO IMPROVE BLANKET ORDER PAYMENT SCHEDULE CALCULATIONS

Luanne B. Handley, GS-11
Charles W. Kowalchuk, Captain, USAF

LSSR 22-82

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The United States Government, to enhance its objectives of peace and security, provides military logistical support to friendly foreign nations through Foreign Military Sales (FMS). By law, the U.S. agencies which manage the FMS programs must ensure they operate those programs without expenditure of U.S. appropriated dollars. Official audits of these agencies revealed their general failure to recover all costs on a timely basis. These audits specifically noted inaccurate payment schedules of FMS cases as a partial cause of this failure. To date, the few efforts to improve payment schedule accuracy have met with little success. To remedy the situation, this thesis was undertaken to perform an exploratory statistical analysis of selected types of blanket order (follow-on support) FMS cases, and to provide an empirical basis for payment schedule accuracy improvement. Specifically, the study ascertains if current FMS blanket order payment schedules do reflect actual delivery behavior. It also makes a determination of whether or not identifiable FMS delivery and ordering patterns exist, and if a relationship exists between specified delivery and ordering pattern types. These tasks are accomplished through statistical testing and the use of computer data analysis.

LSSR 22-82

AN EXPLORATORY ANALYSIS OF FMS DELIVERY DATA TO IMPROVE BLANKET ORDER PAYMENT SCHEDULE CALCULATIONS

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

Luanne B. Handley, BA
GS-11

Charles W. Kowalchuk, BA
Captain, USAF

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This thesis, written by

Ms. Luanne B. Handley

and

Captain Charles W. Kowalchuk

has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT

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CHAPTER I

INTRODUCTION

Overview

Payment schedules, required by the Department of Defense (DOD) as part of the financial annex, are a condition of each Foreign Military Sale (FMS). Because payment schedules are cash forecasts designed to ensure timely payment for articles and services to be delivered, it is essential that they be accurate and measurable. The need for accurate payment schedules has become a topic of increasing international importance, as evidenced by the following 21 June 1982 SAAC message:

> 2. Payment schedules are an integral part of an FMS case and should represent the best USG estimate of phased case requirements to meet expenditures for performance rendered as well as for termination liability and contractor hold back reserves. Customer countries are increasingly sensitive toward putting excess deposits up front on an FMS case and later finding out that a substantial part of the deposit was unneeded (for disbursement or reserves) for long periods of time.
>
> . . . . . .
>
> 4. In view of the financial sensitivity of payment schedules and the varied options available to customer countries when excess funds exist, request all country program managers be particularly attuned to the need for updating payment schedules whenever case ordered values are changed or there is a slippage/increase in case performance. . . [19:1].

Though Defense Audit Service (DAS) audits and the general consensus of FMS financial management analysts

indicate that current payment schedule procedures often culminate in inaccurate forecasts, little has been done to improve them. The military service response has been directed primarily towards the mechanization of payment schedules. Attempts to improve accuracy have been few. Most of these attempts were directed towards defined order cases, since Price and Availability (P&A) studies provide advance delivery information on these cases. To date, no research has been directed towards blanket order open end[1] cases. Mr. John Blair (7), Director of Program Control, International Logistics Center, ILC/OOC, suggested that case ordering patterns affect resulting delivery patterns. This thesis was designed to research that suggestion. Selected Air Force International Logistics Center (ILC) managed blanket order (B/O) payment schedules were statistically analyzed to: (1) assess their accuracy, (2) perform exploratory analysis on FMS ordering and delivery data for pattern analysis, and (3) statistically determine if ordering and delivery patterns are related.

This chapter provides a conceptual background for the thesis. Areas addressed include a background of FMS, its financial management, the problem background, related research and a formal statement of the research problem,

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[1]The term blanket order open end and blanket order are used interchangeably.

objectives, goals, and questions. It concludes with a synopsis of the research methodology and thesis format.

FMS Overview

The U.S. Security Assistance (SA) program consists of the sales of defense articles, services, and training and, in specified cases, the grant of such articles and of economic supporting assistance (29:Part I, A-1). Public and legislative attention is increasingly directed at FMS, due to its importance as a political tool in foreign policy and its effects on the U.S. economy as a source of employment and revenue. FMS is the segment of Security Assistance which sells defense articles, services and training to approved foreign governments through prearranged cash or credit arrangements (29:Part I, A-1).

The Arms Export Control Act, as amended, is the legislative basis for the FMS program. This law is subject to annual congressional review and update (29:Part I, A-1).

The objectives of the FMS program are to help allied and friendly countries and international organizations strengthen their military capability to maintain internal security, defend themselves against external threats, and contribute to their regional defense (24: p.1-1).

As the Military Assistance Program (MAP, that portion of SA provided through congressional and

presidential grants) declined in the early 1970s, FMS was predicted to grow, filling the gap. No one, however, imagined how dramatic this growth would be. In less than a decade, the U.S. has become second only to the Soviet Union in arms transfers. While FMS sales accounted for only 13.7 billion dollars between fiscal year 1950 and 1971 (28:p.1-6), sales in 1982 alone are expected to exceed 20 billion dollars. Of the 107 countries and international organizations currently eligible to purchase DOD defense articles and services through FMS (29:Part II, A-2), seventy-six of them actively participate (28:p.1-6).

All military services and certain other Department of Defense (DOD) agencies participate in FMS. Each service/agency has designed offices responsible for preparing Letters of Offer and Acceptance (LOA, the FMS case) for which that service is the primary item manager. Though all service implementing agencies are governed by the same general DOD guidance, operating procedures are not standardized. In the Air Force, foreign military sales consists of system sales, system package sales and follow-on support. A system sale may be aircraft, missiles, or communications electro-magnet (CE) equipment from new production, USAF inventory or USAF excess (24:p.7-1). The system package sales is a system sale which includes initial support. It consists of the lead (for the system) with many subcases designed to provide

total support for an initial startup period (usually twelve months). These subcases can include training, maintenance and administrative support.

Follow-on support, as the name implies, is designed to support the weapon system following the initial support period. Instead of the package concept, it is handled on a case-by-case basis with the customer requesting each individual case according to their perceived requirements (see Figure 1).

FMS follow-on support cases are of two types, defined order and blanket order open end. A defined order case results when a country submits a request for specified items. A Price & Availability (P&A) study is performed, with the resulting LOA including estimated prices and delivery times by item.

A blanket order open end case, on the other hand, occurs when the customer requests a specified dollar amount of items that are not yet definitized. Such a case includes only the total dollar amount to be requisitioned, the type of items and the time period (usually twelve months) during which orders (requisitions) will be accepted. Once the case is accepted and implemented,[2]

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[2]A case is implemented when it has been authorized to accept requisitions.

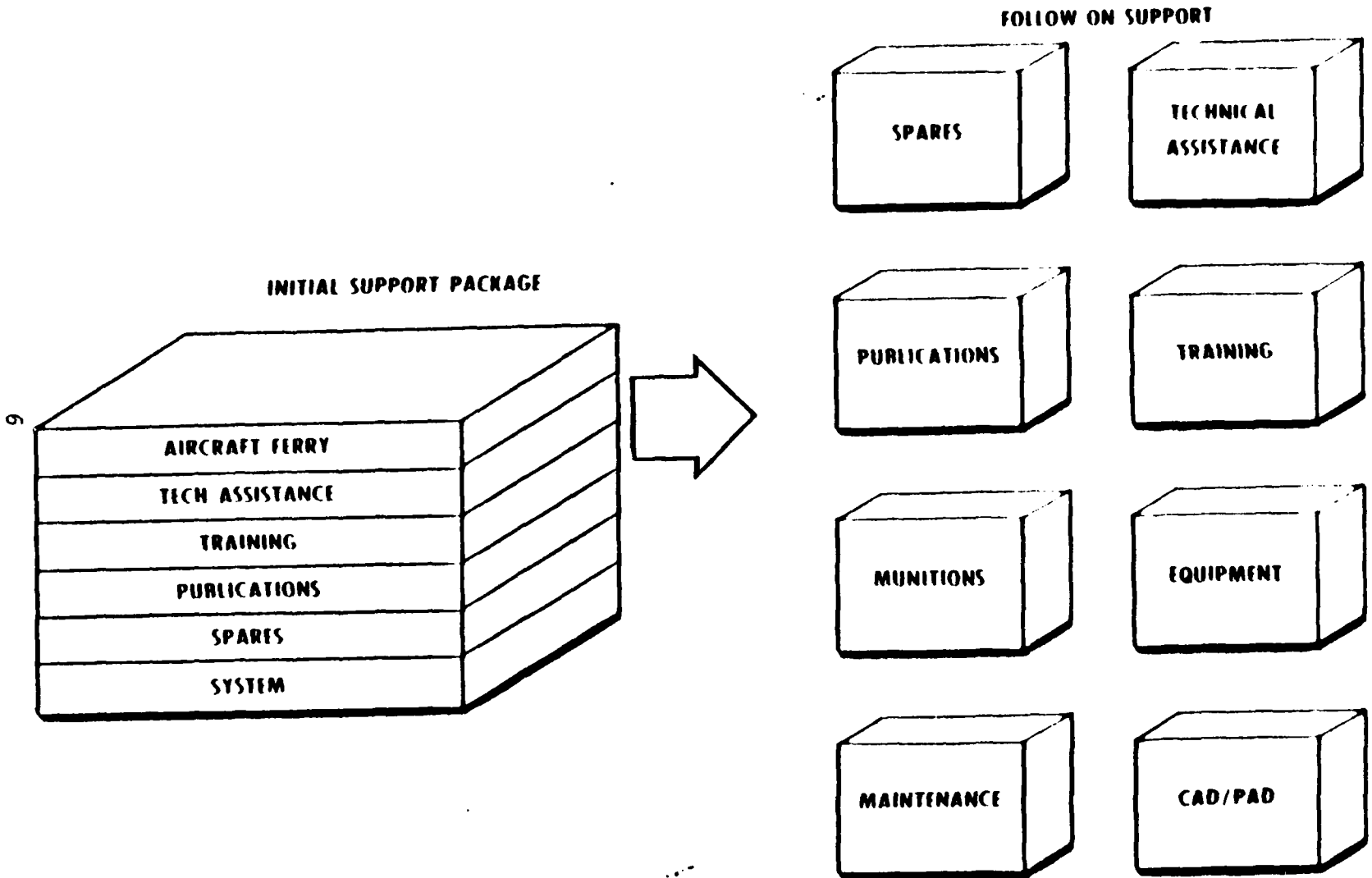

Fig. 1. FMS Support Concepts (24:pp. 2-1 to 2-2)

the country submits its requests for items until either the dollar threshold[3] or the ordering time is reached.

Whenever the scope of any FMS case changes (large price increase, blanket order dollar threshold increases or decreases, ordering time changes, defined items are added, etc.) an amendment (1513-1) is issued. Modifications (1513-2) are issued when changes not involving the scope occur.

Blanket order open end cases include the following: "E"--support equipment, "G"--technical services, "KB"--cooperative logistics supply support arrangement, "M"--maintenance, "P"--publications, "R"--spares, and "V"--class IV modifications ("G," "M," "P," and "U" can also be written as defined order cases). Of these, "R" and "KB" cases are the largest, both in dollar value and numbers of requisitions submitted. Figure 2 is a pie chart showing their relative proportion as compared to the rest of the ILC-managed follow-on support cases.

Blanket Order "R" Cases

This case is for requesting spare parts. Since the ordering period normally lasts only one year, it is usually renewed annually under a new case designator. "R" cases are established for a specific dollar amount and a specific ordering time. (An example would be an

[3]Refers to the total case value of the LOA.

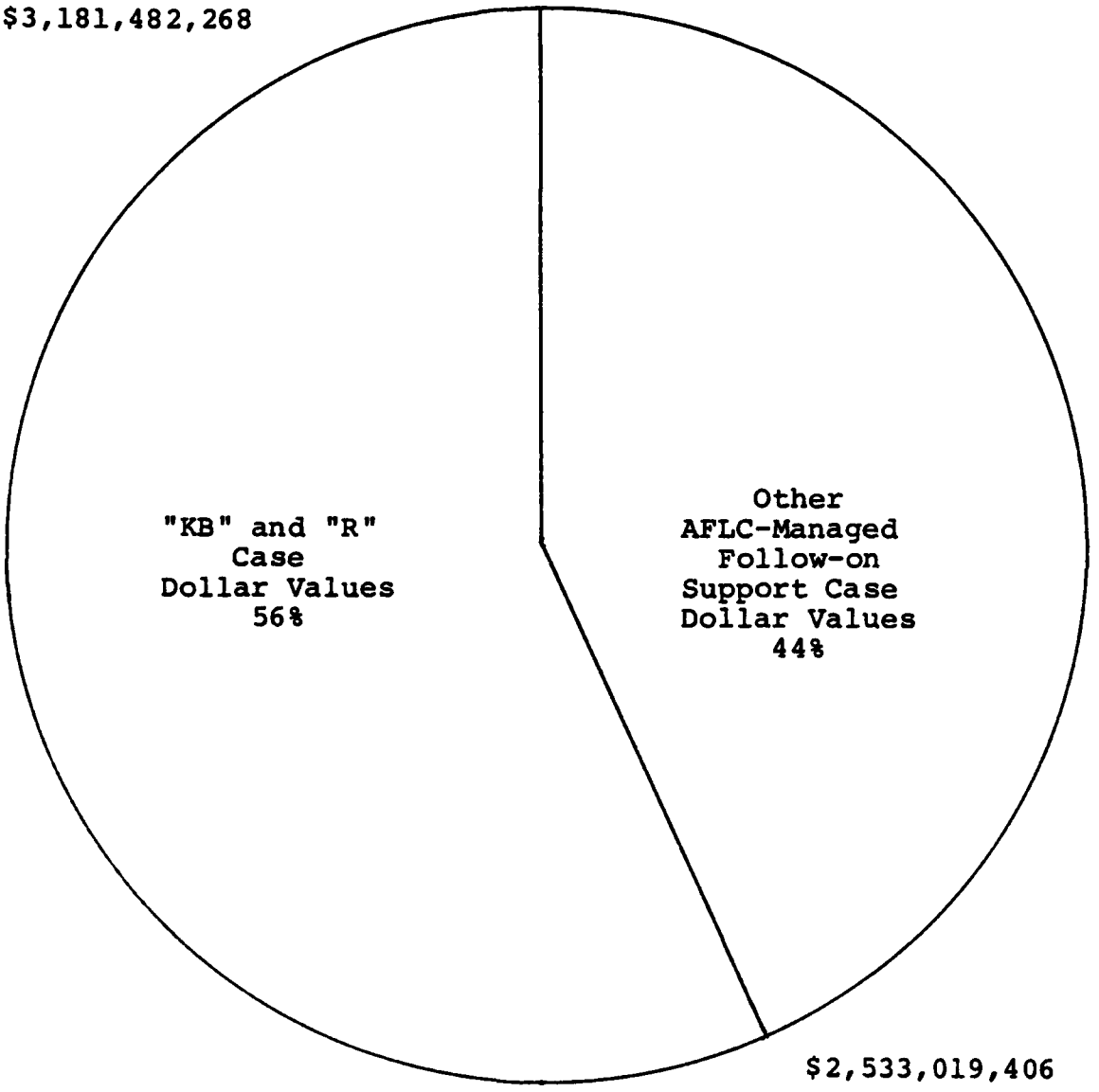

Fig. 2. "KB" and "R" Dollar Proportion Pie Chart

Note: Total Dollars = $5,714,501,674 (active cases as of July 1982)

"R" case for a materiel value of one million dollars and an ordering period of one year, from 1 January 1980 to 31 December 1982.) Since the USAF cannot procure items before receipt of a requisiton, all items are usually lead time away. These requisitions are filled from DOD stocks only if DOD programs would not be adversely affected. Therefore, most countries use "R" cases for unprogrammed demands, those items which are not projected for continual usage or are not eligible for programmed treatment through a "KB" case.

"KB" Requisition Case

The "KB" case is part of a two-case system referred to as the Cooperative Logistics Supply Support Arrangement (CLSSA).

The first FMS case is the "KA" case, also known as the FMSO I (Foreign Military Sales Order). The stock level case (FMSO I) defines the customer country requirement for seventeen months of follow-on spares support to be continuously maintained on-hand or on-order for the customer. This case serves as the financial basis for determining the investment to be deposited by the FMS customer (22:p.1-1).

Materiel is not transferred to the country through the stock level case. The annual "KB" case is the instrument through which the country requisitions those items

previously identified on the "KA" case. It is established with a specified dollar amount and ordering time like other blanket order requisition cases. Items ordered through this case, which were identified as part of the FMSO I, are treated as programmed. Programmed demands, as a result of being identified early for consolidation into USAF buys are filled before any other FMS demands and at USAF inventory prices (24:p.8-2). Also, since inventory levels were adjusted to expect these foreign demands, more items are eligible to be shipped from stock, or are already on-order, thereby decreasing lead time as well as price. Unprogrammed demands are treated the same as "R" case orders.

Background of FMS Financial Management

The International Security Assistance and Arms Export Control Act (AECA) of 1976 increased both Congressional involvement in the FMS process and placed increased emphasis on insuring the recoupment of all authorized surcharges: to include administrative services, use of plant and production equipment, nonrecurring R&D and production costs (16:pp.3-40 to 3-41). This was deemed necessary due to the phenomenal growth in FMS, and its inherently dynamic nature. A further congressional restriction that no U.S. taxpayer dollars may be spent in anticipation of foreign military sales, made it imperative

that foreign payments for goods and services be collected prior to U.S. expenditures for procurement or fulfillment of customer orders. Responding to Congressional interest, the Government Accounting Office (GAO) initiated a study to determine how well the military services financially managed the FMS program. Their findings, though not published until the fall of 1978, concluded:

> The Department of Defense has failed to operate the foreign military sales at no loss to the Government as required by law. The Government, therefore, has absorbed many millions of dollars in cost which should have been recovered from foreign customers [21:cover].

This was one of several GAO reports that came to the same conclusion.

Fred B. Wacker, Assistant Secretary of Defense, also had these deficits in mind when he issued his historic 17 June 1977 memorandum, outlining financing and accounting procedures for FMS program management.

> The importance of financial management and, in particular, the administrative control of funds cannot be overemphasized. Recent correspondence from the President and OMB has stressed the importance of establishing and maintaining adequate financial management systems in order to prevent overobligations and overexpenditures. The recent and sudden growth in the volume of FMS has caused major impacts on the financial management systems used to control our own appropriations [6].

Wacker's memorandum levied additional responsibility on the military departments for assessing and recouping all direct and indirect costs incurred in the FMS customer-support process. By early 1978, financial management and

planning had become not just a responsibility for the accountant, but also for the international logistician. According to AFR 170-3:

> Financial roles and responsibilities include financing of support provided (reimbursable or direct cite), obtaining funds from foreign countries and international organizations on a timely basis, ensuring reimbursement for support provided, and monitoring the status of FMS cases and MAP programs [23:p.1-1].

The most significant of these new financial regulations were obligational authority, 2060/2061s and payment schedules. These new procedures were adapted, in particular, since it was "recognized that there were significant imbalances in what we were collecting and what we actually needed on a case basis [7]." Obligation authority (OA) is the authorization to implement a case (begin requisitioning) after receipt of the initial deposit. The 2061 is a planning directive designed to plan expenditures and forecast orders and resulting reimbursements to the USAF performing appropriations. Payment schedules were implemented to achieve "more precision in cash forecasting (7). These schedules, included in the LOA financial annexes, itemize quarterly FMS case payments by date and amount to pay for goods and/or services projected for delivery the following quarter (7; 28:App.C-1 to C-8). The quarterly payments are based on percentages of total FMS case value, originally provided for case type basis, by SAAC. This schedule, then, is the basis for the case collection by SAAC.

The organization responsible for payment schedule preparation for ALC FMS cases is the Financial Control Division, Directorate of Programs, International Logistics Center (ILC/OOCF) (7). The ILC is part of the Air Force Logistics Command (AFLC) and is located at Wright-Patterson Air Force Base. The ILC is currently commanded by General A. Paul Bruno, who is also the assistant for International Logistics on AFLC/MI, AFLC staff organization. The ILC is responsible for preparing, implementing and managing all FMS follow-on support cases. They also assist the Aeronautical Systems Division (ASD) on FMS sales of major weapon systems.

Background of Problem

As the FMS program has increased in importance as a tool of U.S. foreign policy, so has it gained more congressional concern and attention. This concern has resulted in both increased governing legislation and subsequent studies of FMS program management. One area of concern and study, is the preparation and accuracy of FMS payment schedules.

Payment schedules serve two basic functions. First, the payment schedule gives the customer foreign government a basis for budgeting their quarterly expenditures throughout the course of FMS contract performance. A failure to budget sufficient funds might jeopardize a country's case. Conversely, if a country budgets too much

for a particular time period, its funds may be unnecessarily prevented from being applied to domestic or other critical needs.

Secondly, FMS payment schedules provide the U.S. with a method of assuring customer payment in required time periods. Therefore, if payment schedules are inaccurate, the U.S. Department of Defense may not receive timely reimbursements for expenditures made in support of FMS.

Problem Recognition

Recent studies and audits of FMS financial management, as well as customer country complaints, have charged FMS payment schedules as being highly inaccurate. Specifically, a Defense Audit Service (DAS) report noted large variances, involving millions of dollars, between actual case costs and those initial estimated costs reflected in payment schedules (25:21). The report also recommended that the military services perform reviews of the payment schedules on existing cases and revise the schedules to make them more accurate (25:21).

Responding to the DAS report, ILC personnel initiated studies to determine the accuracy of current payment schedules, and to determine if and how payment schedules could be improved (12). Part of the ILC's reply to the DAS report stated, "This [improvement payment schedule

accuracy] has been a continuous problem due, in part, to inadequate data products required to effectively monitor price and delivery date changes [25:21]." The problem is particularly bad when addressing blanket order cases since they must be forecasted with no advance P&A data. Automated payment schedule computation methods, recommended by the DAS report, while improving efficiency, would not necessarily increase payment schedule accuracy. It would appear that a real-world imitative or statistical model would aptly aid in achieving accurate payment schedules.

Related Research

There has been very little serious research performed in the areas of payment schedule accuracy analysis and improvement, primarily due to the newness of the requirement. Although several methods for payment schedule accuracy improvement using models have been attempted, none appear to have a statistically supportive basis. For the most part, these model attempts are solely based upon the historical data for specific cases--such as Air Force Systems Command (AFSC) attempts to capture the timing of costs in a manufacturing and production process, based upon recent sales of F-5 aircraft (9:19). Some use has been made of the computer for estimating and computing payment schedules (17). However, such applications were mainly efforts to decrease the excessive computational time required to manually compute all appropriate

surcharges, such as administration and transportation, for each item in the payment schedule. Other approaches--like that of the Army's use of an exponential component to describe contractor costs in certain procurement cases--are attempts to force specific distribution patterns on to payment schedules. These approaches lack in-depth statistical analysis of past case experiences and the benefit of an empirically supported model analysis (9:16).

In an attempt to improve payment schedules for procurement type FMS cases, the Army Materiel Development and Readiness Command sponsored a 1980 study, which used statistical methods to forecast the amount and timing of procurement costs. The Army study attempted: (1) to develop and apply improved procedures for forecasting customer payments, (2) to determine the statistical relationship between orders and delivered item costs, and (3) to determine the applicability of the procedures for forecasting the Army's domestic procurement program (8:v). The study was initiated for the specific purpose of analyzing procurement cases. It used only one independent variable, customer orders, and did not examine any other variable, such as country or procurement source (8:12-13).

The study concluded that the statistically-based forecast used was no improvement over the Army's currently used technique of aggregating forecasts for individual orders into one total forecast (8:45-46). Further, the

study noted there were many factors not included in this model (such as strikes, materiel shortages, and even political factors), which influence or may even dominate the payment schedule computations process (8:15).

Another study of note is a 1980 AFIT graduate thesis written by Captains John W. Dutcher II and Douglas C. Van Wiggeren. This study provided an assessment of current evaluation methods of FMS payment schedule accuracy. The thesis concluded that the three evaluation methods analyzed were invalid because "none of them adequately accounted for the variance induced by the differences between projected costs and actual costs for the equipment or services sold [9:52]." It supports the contention that claims of payment schedule inaccuracy must take into account other factors which affect the variance between actual and estimated costs, but are not due to incorrect computations, pricing mistakes or similar errors (9:59-60).

Research Problem

The problem for research is that no statistical analysis has been performed on variables which might have a predictive quality for use in FMS payment schedule forecasts. This, and the absence of payment schedule accuracy standards, severely hinder the financial managers' efforts to improve current payment schedule computation procedures.

Research Objective

Our research objective is to determine if current FMS blanket order payment schedules can be improved through analysis of FMS delivery data.

Research Goals

Our research is directed towards accomplishing the following three goals:

Goal 1--to ascertain whether or not current FMS blanket order payment schedules reflect actual delivery behavior.

Goal 2--to determine if identifiable delivery and ordering patterns exist.

Goal 3--to determine if a relationship exists between specified delivery and ordering pattern types.

Research Questions

We will accomplish our analysis of FMS delivery data through answering the following questions:

1. Do payment schedules accurately predict actual deliveries?

2. Do discernable underlying distribution patterns exist in FMS deliveries?

3. Does a relationship exist between ordering patterns and delivery patterns?

Research Methodology

A multi-faceted research approach is being utilized. The first facet consists of statistical tests to assess the existence and scope of alleged payment schedule inaccuracies. This facet is independent of the other two, and uses data collected at the ILC. The second research facet first performs descriptive statistical analysis on "KB" and "R" case ordering and delivery data. Variables of interest are identified and used to determine variable groupings. These grouped variables are then divided into quarters and the resulting patterns analyzed and typed. The last research facet compares the delivery pattern breakdowns, by variables of interest, to the ordering patterns to determine if, as the ILC suggests, orders and deliveries are related.

Scope of the Research

This thesis will perform research on FMS case ordering and delivery data. Since blanket order cases comprise a major portion of follow-on support, and no research has been performed on these cases, they have been chosen as the area of interest. Further, only ILC-managed cases will be used. The research scope was further narrowed to include only "KB" and "R" cases due to time and resource constraints. These particular case types were chosen since they are the largest follow-on blanket order cases, both in requisitions and dollar value.

Summary and Thesis Format

This thesis is presented in five chapters. This chapter has served to acquaint the reader with FMS and, in particular, the role of FMS payment schedules. The section dealing with the background of the problem serves as the basis of understanding on which we will build in future sections. This was followed by the actual problem statement and research objective. The goals and questions emanating from the research objective were stated along with a brief synopsis of the research methodology and thesis scope.

Chapter II, Foreign Military Sales Payment Schedules, describes in more detail the role of payment schedules and the financial management aspects of FMS. Payment schedule preparation and flow is outlined, as is requisition processing and billing.

Chapter III, Research Methodology, is presented in two sections. Section one, Management Overview, addresses data populations, data collection, the research approach assumptions and limitations in general terms. The second section, Technical Methodology, addresses in detail the research design and each statistical test and technique. Included are data extraction procedures, test and analysis assumptions and decision rules.

Chapter IV, Results and Analysis, presents the results of our research and analyzes them.

Chapter V, Conclusions and Recommendations, answers the research questions raised by our objectives and goals. Conclusions are discussed and recommendations for ILC management action and further research are presented.

CHAPTER II

FOREIGN MILITARY SALES BLANKET ORDER PAYMENT SCHEDULES

Introduction

The preceding chapter introduced the basic concepts inherent to this thesis. This chapter presents a detailed discussion on FMS payment schedules. First, the responsibilities of the ILC, the H051 system, and SAAC are briefly reviewed. This is followed by sections on the purpose, background, and preparation of payment schedules. Finally, requisition and billing flow and how these relate to the FMS payment schedule are presented.

Roles and Responsibilities

Certain FMS functional roles are herewith described to help the reader develop an understanding of payment schedules.

International Logistics Center (ILC)

As mentioned earlier, the ILC is the Air Force Logistics Command (AFLC) focal point for Security Assistance. General A. Paul Bruno currently commands the ILC and HQ AFLC/MI. The Deputy for Operations, ILC/OO, is responsible for designated case negotiations,

implementation, and management. Operations (ILC/OO) is divided into geographic directorates and the Directorate of Program Control. All programs for Saudi Arabia are handled by a special deputate, ILC/SR.

Each geographic directorate is responsible for all managed cases in that segment of the world. Case managers obtain P&A data, prepare LOAs and payment schedules, implement cases, and perform management and supply actions to ensure case delivery and subsequent closure.

The Directorate of Program Control, OOC, is functionally organized. It is responsible for case manager guidance, internal auditing, financial management, LOA review, and surveillance of high visibility programs such as CLSSA and system sales. OOC is currently computerizing LOA and payment schedule preparation. Once accomplished, the Financial Management Division, OOCF, is to assume the responsibility for preparing and revising payment schedules.

H051 System

The H051 System is the AFLC Security Assistance data base. It was designed "to monitor catalo[illegible], supply transportation and financial data for the purpose of managing Security Assistance agreements [4:1]." It maintains an audit trail for all active FMS transactions and a modified audit trail for inactive or history data. H051 provides this information by preprogrammed interrogations

and reports. Developed in the 1960s, it is not adequate to current demands, and plans are to replace it with the Security Assistance Management Information System (SAMIS). The ILC is now developing this new system, which should be implemented by 1984.

Security Assistance Accounting Center (SAAC)

SAAC (the Security Assistance Accounting Center) is located at AFAFC (Air Force Accounting and Finance Center) in Denver, Colorado. It is responsible for country billing, cash collection, trust fund accounting and administrative fee management. SAAC performs these functions for all FMS cases involving the three military services; Air Force, Army, and Navy (3:p.13-2).

Purpose of Payment Schedules

All requisitions (orders) against an FMS case create financial obligations (contract authority). Each FMS customer is responsible for meeting the cash requirements to meet these obligations. Funds appropriated by the Congress for defense purposes cannot be used to liquidate these obligations (contract authority) (26: p.400-1). Sections 21 and 22 of the AECA state that U.S. congressionally appropriated dollars cannot be used for payments against FMS obligations. Therefore, FMS customer cash deposits must be received by the FMS trust fund in

advance of deliveries of defense articles and services sold through FMS channels (26:p.400-1).

This "payment-in-advance" policy, along with legal stipulation that the DOD could not buy in anticipation of a foreign military sale, created new emphasis on payment budgeting by all concerned parties. In 1977, financial annexes became a requirement "to add clarity to financial management and to reduce misunderstandings as to payment requirements between the US Government and FMS purchasers [5]." The resulting payment schedule, part of each FMS contract, would clearly state the amount and times of payments due to SAAC. Each payment would cover the expected costs of all items expected to be delivered the following quarter. This would ensure compliance with the law and provide the customer country with a budgeting guideline to help preclude delinquent payments.

Payment Schedule Background

As previously mentioned, the emphasis on FMS financial management started with the 17 June 1977 Wacker Memorandum. SAAC was purchasing a mechanized nineteen-quarter delivery projection compiled from information obtained from the military department's data bases. Since payment schedules were now to be a major financial management and planning document, it needed to be included as part of the LOA. This, and a change in the SAAC

computer system, prompted the transfer of delivery forecasting responsiblity to the implementing agencies. In 1978, financial annexes were initiated featuring a delivery forecast called the payment schedule, from which SAAC would bill customer countries.

Minimal instructions and no additional manpower was provided to the implementing agencies, who were faced with the monumental task of preparing these schedules for all open FMS cases. The ILC alone screened more than 1700 cases and prepared schedules for approximately 1200 of those cases (13). To prepare payment schedules for their cases, the ILC requested copies of the SAAC quarterly forecasts for blanket order cases. SAAC provided forecasts, but in Generic Code[4] breakout instead of the requested case type breakout. These were of little help to the ILC and they again requested data based on case type. During this same time frame, guidance on when to revise payment schedules, payment due dates, and payment schedule length changed several times. The result was an initial group of schedules with little uniformity, based upon what amounted to the preparing country manager's "best guess." Independent analysis of deliveries was precluded due to the short time span allowed for payment schedule preparation for all open cases and lack of

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[4]Three-digit code used to consolidate SA articles and services into homogeneous categories for management and reporting purposes.

qualified personnel. In February 1979, SAAC finally provided the requested nineteen-quarter delivery summaries by type case, a percentage breakdown based on the same historical data that generated the generic coded data. Copies were provided to the individual country managers to serve as a basis for future payment schedule preparation. These percentages, accompanied by detailed guidance on schedule preparation, were included in ILCR 400-77, The Case Managers Handbook, published in 1980. The handbook provided detailed guidance to standardize FMS management procedures, including payment schedule preparation. Early the following year, the authors of the regulation requested SAAC to update the percentages which were based on 1977 and prior information. SAAC had yet to produce a new data run when this thesis began.

Payment Schedule Preparation

Every DD 1513 must have a payment schedule. Each implementing agency, as previously stated, is responsible for preparing schedules for their own cases. They are also responsible for periodically reviewing these schedules. Revised payment schedules are issued when an FMS case increases or decreases in value or when discrepancies, 500,000 dollars or greater, between actual deliveries and estimated payments due are noted (7).

The Military Assistance and Sales Manual (28), the FMS "bible," instructs the implementing agencies to place payments over a one-year period (one-fourth of the total case value each quarter) for blanket order cases (28:App.C-2). The Army and Navy follow this guidance when preparing their blanket order cases. However, such payment schedules keep country funds committed to the FMS trust fund unnecessarily, since many items are not delivered during that time frame. For a country with a tight defense budget, this is a cause of concern. The ILC, in keeping with the original intent of payment schedules, forecasts the financial requirements to coicide with projected deliveries over a fifteen-quarter period. ILC blanket order payment schedule procedures are presented in the next several sections.

Initial Payment Schedules

The ILC is responsible for preparation of payment schedules for all follow-on support cases under its cognizance. These cases are typed as firm order and blanket order cases, each type requiring a different method of computing the schedules.

Defined order payment schedules are initially more exact because the projected payments are derived from P&A studies provided by the supply point prior to case implementation. The ILC is currently involved in mechanizing preparations of these schedules on their mini-computer.

Blanket order initial payment schedules are calculated using the quarterly delivery percentages provided by SAAC in 1978. These are listed in table form for all blanket order case types in ILCR 400-77. Since exact delivery amounts and times are unknown until after the fact, and the requisition volume of these cases is too great for individual computer interrogation, the preparers rarely vary from these percentages. First, the case manager projects the number of months during which items can be requisitioned and delivered, between case implementation and the first bill issued to the country by SAAC. These are indicated as months of initial deposit in Table 1. The initial deposit must cover all of these projected deliveries. To determine the percentage of required initial deposit, the preparer locates the column of payment schedule percentages under the applicable month period (from the percentage table). These percentages are multiplied against the LOA bottom line value (materiel plus authorized surcharge) becoming the amounts due. These amounts, when listed with their due dates, become a payment schedule. Figure 3 is an example of a payment schedule in the LOA financial annex.

Payment Schedule Revisions

FMS cases should be periodically reviewed and revised whenever major discrepancies are discovered between

TABLE 1

QUARTERLY PAYMENTS BY LENGTH OF INITIAL DEPOSIT PERIOD

Payment	Months of Initial Deposit						
	0	1	2	3	4	5	6
Initial Deposit	0	4	8	13	18	23	28
1	13	14	15	15	15	15	14
2	15	15	15	14	12	10	9
3	14	12	10	9	9	9	8
4	9	9	9	8	7	6	6
5	8	7	6	6	6	6	5
6	6	6	6	5	5	5	5
7	5	5	5	5	5	5	5
8	5	5	5	5	5	5	5
9	5	5	5	5	5	5	5
10	5	5	5	5	5	4	4
11	5	4	4	4	3	2	2
12	4	4	2	2	2	2	2
13	2	2	2	2	2	2	2
14	2	2	2	2	1	1	
15	2	1	1				

Payment Date	Amount
Initial Deposit	$419,250
15 June 1981	483,750
15 September 1981	451,500
15 December 1981	290,250
15 March 1982	258,000
15 June 1982	193,500
15 September 1982	161,250
15 December 1982	161,250
15 March 1983	161,250
15 June 1983	161,250
15 September 1983	161,250
15 December 1983	129,000
15 March 1984	64,500
15 June 1984	64,500
15 September 1984	64,500
TOTAL	$3,225,000

Fig. 3. Sample Estimated Payment Schedule (2:p.6-19)

payments collected and actual deliveries. However, since this is an extremely time-consuming task and manpower resources are scarce, payment schedules are normally revised only when a change in case scope occurs or a discrepancy of 500,000 dollars or more is noted. When revisions are due to discrepancies, the difference between collections to date (obtained from the SAAC 400 report) and cumulative requirements to date (calculated by adding H051 cumulative deliveries, the administrative surcharge, and 15 percent of committed value) becomes the new total value to be revised. If the difference is greater than 1000 dollars, all successive payments are altered (2:p.3-8).

When blanket order payment schedules, the primary concern of this thesis, are revised due to a change in case value, the country manager must determine the cumulative requirements (CR) to date. To revise the schedule when a modification is issued, the CR is divided by the revised estimated total cost figure to determine what percentage of the new case value has already been collected. The preparer refers to the percentage table and counts up the percentages of each payment until the CR percentage is reached. The revised payment schedule starts at the percentage where the CR stops (2:p.3-8). Revising payment schedules as part of an amendment is slightly different since an initial deposit is calculated for any case value increase. First the value of collections to date is

obtained from the SAAC 400 report. To this, is added the value of all payments, taken from the current payment schedule, which will be collected before the amendment can be implemented and become part of the normal billing cycle. This figure is compared to the CR (derived from H051 figures) and, if greater, the difference becomes the initial deposit collected. The rest of the payment schedule is computed like the initial payment schedule (2:pp.3-10 to 3-12).

Foreign Military Sales Processing

After the payment schedule is prepared, it becomes part of the FMS case. The case is processed through DOD channels, sent to the customer country for signature, and returned to the implementing agency. A copy of the accepted LOA is sent to SAAC along with the initial deposit, if required. The implementing agency obtains Obligation Authority (OA), officially implements the case into H051, and directs requisitioning to begin. SAAC uses the payment schedule from the implemented LOA financial annex to bill the customer country.

Requisitioning and Billing

Requisitions are submitted by the country for blanket order cases. Country managers initiate requisitioning action for items identified in defined order cases. All requisitions move through H051 to the supply agency

data system for fill actions. Status updates routinely flow between the various systems. When an item drops from inventory (D032) or a contractor shipment is confirmed (J041), an entry is recorded in the H075B system at each of the ALCs. Three times each month, H075B mechanically interfaces with H051. If a match occurs with an H051 requisition and ship status, a delivery is recorded in H075B, the Central FMS/GA Delivery Reporting System. Monthly, the SAAC and H051 systems are updated with H075B deliveries. Figure 4 is a diagram of this interface.

Each quarter SAAC bills customer countries the amounts indicated due, according to all FMS payment schedules. Actual delivery billings are not used for collection purposes because they are known only after shipment. Payments are required by law prior to or at time of shipment. Totals for actual deliveries recorded by H075B are contained in the 400 report. (Country managers have access to this report.) SAAC does have the authority to alter the bills from those designated on the payment schedule. This, they sometimes do, at country request or due to discrepancies noted by the "K" card process. The "K" card process is based upon committed (requisitioned, but undelivered) data submitted to SAAC by the military departments, by the 15th day of the last month of the quarter. This value is compared to each case's quarterly payment schedule forecast. If the open requisition value

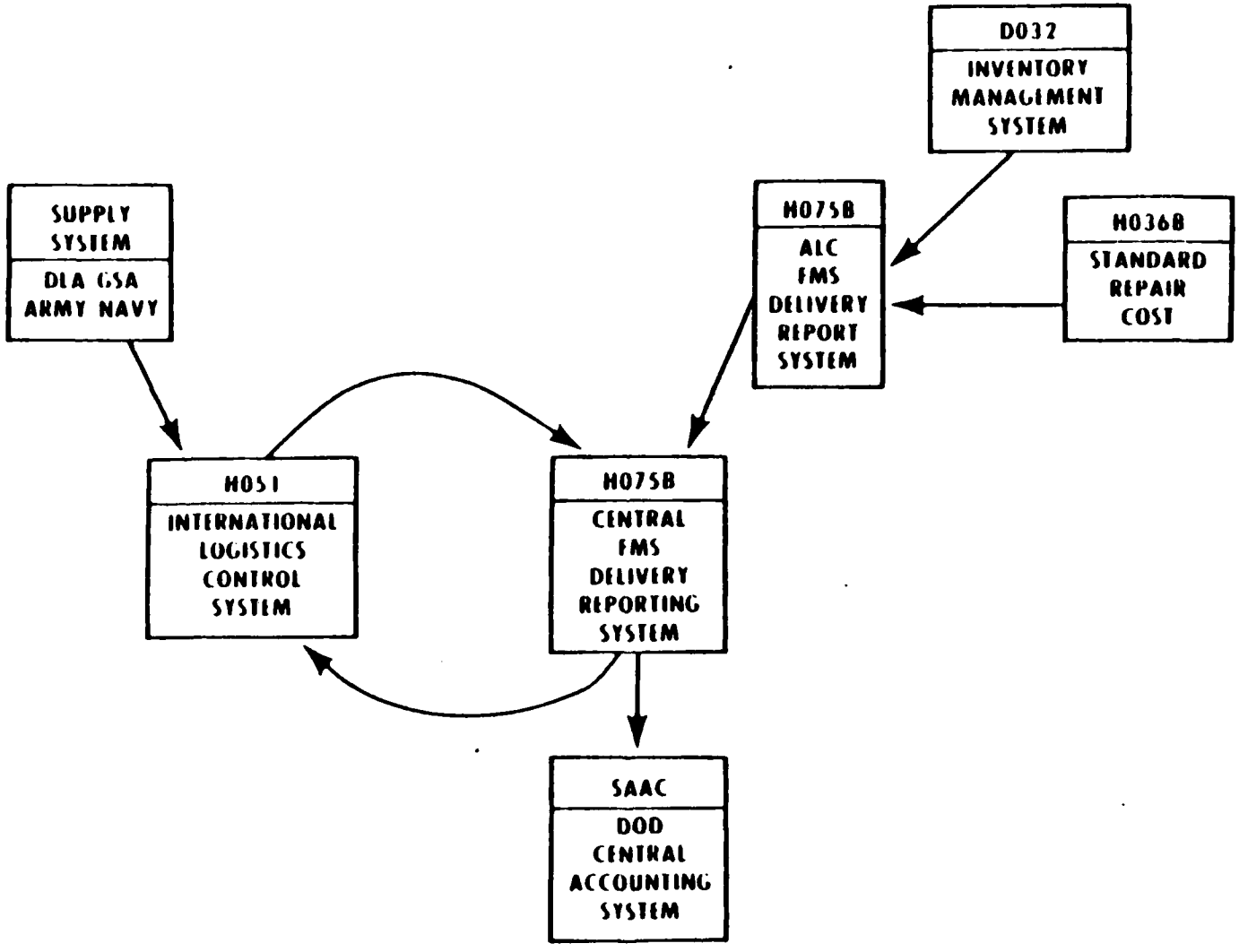

Fig. 4. Delivery Processing (25:p.1-3)

is less than the forecast value, the forecast is reduced and only the value of open requisition is billed. If the value of open requisitions is equal to or greater than the quarter's forecast, nothing is changed (18). This is designed to preclude overcollections. However, it does not correct for undercollection or previous overpayments. It assumes that only those requisitions already processed will deliver and that they will all deliver the following quarter.

Summary

The chapter has examined the purpose, history and preparation of FMS payment schedules; in particular, blanket order payment schedules. Payment schedules were deemed necessary to effectively predict case requirements for both the customer countries and the U.S. Air Force. That payment schedules have not been meeting their objective was alluded to in Chapter I. The following chapter outlines the methodology used in this thesis to examine both payment schedule accuracy and FMS delivery behavior.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

The preceding chapters introduced the purpose, preparation of, and controversy surrounding FMS payment schedules. This chapter provides detailed rationale for the research approach outlined in Chapter I. Decisions affecting the scope and direction of this thesis effort are delineated.

This chapter begins with a management overview defining the data population, data collection procedures, research approaches, and the overall research assumptions and limitations. Following the overview is the technical methodology. This section presents the rationale for the research design selected and a detailed account of the statistical tests, assumptions, hypothesis and decision rules explored to achieve our research goals.

Management Overview

This thesis used a series of exploratory and analytic techniques to achieve the research goals stated in Chapter I. A research design was developed to answer the research questions associated with each goal. Appropriate data were defined, collected, and used in a three-faceted

research approach. Each facet corresponded to a separate research goal. For reader convenience, the three research goals are restated.

Goal 1--to ascertain whether or not current FMS blanket order payment schedules reflect actual delivery behavior.

Goal 2--to determine if identifiable delivery and ordering patterns exist.

Goal 3--to determine if a relationship exists between specified delivery and ordering pattern types.

Data Population

To achieve our research goals, three different data populations were sampled. All data populations examined were from the universe of Air Force Logistics Command (AFLC) managed FMS transactions. This encompasses all data pertaining to any of those requisitions. Each type of data represents a distinct population which can be viewed as itself or in a relationship with other populations (variables). Each population is made up of a set of many values or measurements.

Population A. This is the data population of "KB" and "R" case payment schedule error percentages. The data elements represent the dollar difference, as a percent, between the scheduled payments, from the LOA financial annex, and actual quarterly deliveries. In the first

research facet, analysis and statistical tests were performed on sample data from this population.

Population B. This data population comprises all ordered dollars against "KB" and "R" case requisitions. Sample data were used to identify and categorize ordering patterns in the second facet of research. Resulting data population pattern types were also the input for the third part of the research effort.

Population C. This is the data population of all "KB" and "R" case delivered requisition dollar values. Sample data from this population were used to identify and categorize delivery patterns in the second part of the research approach. The delivery pattern types resulting from analysis of this population also served as input data for the third research facet. In addition, these delivery dollar values were grouped as projected deliveries (payment schedule data) and actual deliveries, for statistical testing to determine if payment schedules do approximate the data population of delivered requisition dollar values.

Data Collection Plan

This research team drew upon several data sources to obtain all the sample populations necessary to pursue this research effort. Both ILC and SAAC data bases were

used to furnish data. Data stored in the Security Assistance Accounting Center (SAAC) data base were used only because the H051 system could not be queried directly. As mentioned in Chapter II, the H051 system monitors and retains an audit trail of all Security Assistance (SA) transactions which interact with any AFLC organization. But, also as previously mentioned, no special interrogations of H051 are being processed since all manpower is directed towards the implementation of the Security Assistance Management Information System (SAMIS). Hence, all samples from the delivery and ordering dollar data populations were collected from the SAAC IBM computer. Since the majority of delivery information is stored in the FKA tapes (history files), and a computer search of all data tapes was beyond the scope of this thesis, only the 28 FKA tape reels were queried.

Data were collected on the machine-readable codes which identified the data populations of interest and on other variables of interest. Requisitions and ship/delivery transactions are submitted and processed in standard MILSTRIP format. This computer data line consists of many alpha-numeric codes. Each code or data element represents a piece of information about the transaction. These data elements can be used to describe the transaction itself, or describe an aspect of another data element. Variables of interest, were codes which these researchers

felt might influence either the delivery and ordering dollar populations, or the relationship between the two populations. The codes selected for all sampled data transactions (requisitions) are listed in Table 2. This sample population was used for all analysis relating to goals 2 and 3.

These data elements were furnished from requisitions from "KB" and "R" cases implemented between 1 October 1977 and 30 September 1979. This two-year period was chosen to ensure a significant sample size of cases with at least ten quarters worth of data for pattern analysis. Ten quarters, as mentioned before, were selected at ILC suggestion since, typically, a significant amount of the case dollar value delivers during that time.

FMS requisitions billing are recorded at estimated and actual prices. Requisitions for Air Force-managed items are usually billed at an estimated price (price code "E"). After the item's final cost is determined, the estimated billing is credited and a price code "A" (actual price) delivery transaction is recorded. Collection of all requisition price data ("A" and "E") would result in duplicate data for many requisitions. Therefore, for all ALC RIC coded items, only estimated ("E") delivery transactions were used.

Interservice ("3L" fund code) items usually are billed only with actual (price code "A") transactions.

TABLE 2

DATA ELEMENTS

Codes	Interpretation
Routing Identifier Code	Item supply source
Delivery Source Code	Identifies whether item is from inventory of procurement
Extended Value	Dollar cost of the entire requisition
Ship Date	Date the item drops from inventory or is shipped from a contractor facility
Julian Date	Date of requisition obtained from the document number, used to identify when the requisition was processed
Price Code	Identifies whether item is valued at an actual or eximated price
Country Code	Indicates the customer country
Case Designator	Identifies which FMS case the item was requisitioned under

Interservice requisitions include those requisitions submitted through an Air Force-managed case, but supplied by other DOD agencies and services: Army, Navy, Coast Guard, Marines, Defense Logistics Agency (DLA) and General Services Administration (GSA). Only actual ("A") coded requisitions were collected for these supplying organizations. RIC was selected as the basis to determine if actual or estimated priced requisition values would be extracted. This was necessitated since the fund code was not retained in the SAAC FKA tapes.

The payment schedule error population was obtained through computer calculation of the error percentages between actual delivered dollars and the corresponding payment schedules for the same delivery periods. The payment data was collected from the LOA financial annexes retained in the ILC case manager files. Since payments are scheduled by quarter, the only manual calculations performed were to convert the payments to percentages based on the total case materiel value at the end of the collection period.

This research team decided to collect ten quarters of data, since this was the period of most interest to the ILC (7). Payment schedules have been developed for new cases only since the end of 1978, and R066 reports were not retained by the ILC in consecutive order prior to the middle of 1979. Therefore, only cases where the first

payment after the initial deposit, was scheduled between the second quarter of 1979 and the first quarter of 1980 could provide the desired ten-quarter sample. Cases of 1000 dollars or less were excluded from sampling since these cases have schedules of only one payment.

Sample data from the populations of requisition delivery dollar values and payment schedule errors were collected to perform the statistical tests of research goal 1. Data collection was hampered by: (1) the necessity to collect data from both populations over the same time period, (2) the need for at least ten data points (quarters of data) per case sampled, and (3) the availability of only a small amount of data meeting the above two requirements.

Delivery dollar data was collected from the Requisition Management Statistics (R066) report produced by the H051 system. This monthly report produces cumulative delivery statistics on requisitions by number and amount for every active FMS case. Delivered dollar totals were collected at the end of each quarter for all cases sampled. They were manually converted from cumulative totals to delivered totals within quarters. These totals were then converted to percentages based on the total materiel value of each case at the end of the collection period.

Research Approach

The first research facet was constructed to assess the scope of alleged inaccuracies through statistical testing. This was accomplished by comparing quarterly cash payments from case financial annexes to actual dollar deliveries for the same cases and time periods. By pairing these sets of figures (projected deliveries with actual deliveries), a quantified error range was obtained. This pairing also made possible the use of two statistical tests to determine if payment schedule inaccuracies were statistically significant. The Chi-Square Goodness-of-Fit test determined if the distribution of delivery payments, on a case basis, was distributed the same as the actual deliveries. The Wilcoxon Matched-Pairs Signed Rank test, alternatively, examined the data to determine if the differences, within any particular quarter, amongst all cases, were significantly different from zero. Additionally, frequency statistics were performed on the error percentages, by quarter, to provide the ILC with information about the errors.

The next research process employed several exploratory techniques needed to accomplish pattern analysis. Initially, frequency statistics, performed on requisition counts, were computed for each value (individual code) of each variable of interest. The individual values for each variable, based on the results of the descriptive

analysis, were combined into homogeneous groupings to facilitate subsequent pattern analysis.

In addition to analysis based on case breakdowns, certain other variables of interest were selected because this research team felt that deliveries could be influenced by certain factors. Two influencing factors were identified for inclusion in this thesis. The first variable of interest was the Delivery Source Code (DSC). It was chosen because how the item is supplied, from inventory or procurement, directly affects delivery time. The second variable examined was the Routing Identifier Code (RIC). Since different supply organizations release assets based on differing criteria and procedures, the source of supply was felt to also directly influence delivery times.

The second part of this facet was the pattern analysis, itself. Histograms, a descriptive statistical technique, were computed by the Statistical Analysis System (SAS) computer program. They were obtained for ordering data by country, and delivery data by individual case, RIC groups and DSC categories within each RIC group. All histograms were based on quarterly percentages of ordered or delivered dollars from their respective populations. Delivery times were computed from the implementation date of the case. Case implementation dates and total materiel values, not available from the SAAC FKA tapes, were added to the sample data in a Statistical Analysis

System Computer (SAS) program. Various prepackaged programs were adapted to provide the necessary computations and analysis for our research. Similar histogram patterns were identified and typed together within each variable.

Finally, the last research facet determined whether a relationship exists between the ordering pattern types and the delivery pattern types. Contingency tables analysis was performed. In this test, a two-dimensional matrix was constructed to compare ordering types to delivery types. The number of observations for each delivery pattern occurring with a particular ordering pattern type was recorded. A computerized program then statistically determined if the relationship between observations of occurrences of matched pattern types was dependent or independent. Three separate contingency tables were used; one for case delivery pattern breakdowns, one for RIC pattern breakdowns, and one for DSC pattern breakdown within RIC.

Research Assumptions

As previously mentioned, a number of assumptions were necessary in order to answer the research questions. The following assumptions were made:

1. The data collected from the ILC files and the H051 and SAAC data bases were complete and accurate.

2. Since an item changes title before it is physically delivered to the customer in-country, the ship date was considered to be the delivery date.

3. Since each sample country's requisitions normally flow through the same communication system, the julian date was considered a consistent representation of the requisition date, on a country/case base.

Research Limitations

Chapter I briefly addressed the scope of this research effort. Blanket order cases were selected since no previous research had been performed in this area. "KB" and "R" cases were focused on, due to time and resource constraints.

Though many variables can influence FMS orders and deliveries, only a few were examined. Certain variables of interest were excluded from consideration because the H051 data base could not be interrogated directly. Other variables could not be quantified or examined in a research project of such limited scope. Such factors can include, but are not limited to, a particular country's budget cycle, acquisition of a new weapon system, political upheaval, Department of State direction to expedite deliveries, labor strikes, and acts of God.

The countries of Ethiopia and Iran were excluded from this thesis since suspensions and subsequent early case closeouts would present a distorted delivery pattern.

Additionally, all cases under 1000 dollars were excluded since no payment schedule is prepared (all dollars are collected up front).

Technical Methodology

Research Design

Our design, "plan for conducting research [20:21]" was selected given the following considerations:

> (a) the amount and type of previous research related to the phenomenon of interest, (b) the resources available to conduct the research in question, (c) the extent to which the results of a given study will be believed and used by organizational managers [20:22].

The inherently dynamic nature of FMS, and the limited time and resources available for this thesis, dictated the use of historical FMS transactions as our data base. Experimental designs are applicable only when the researcher controls or manipulates the variables (20:92). Since historical data precludes direct control (all action has taken place and the variables are given and unchangable), we constructed an ex post facto (after the fact) design. The criteria for this method appropriately describes our data source.

> . . . the investigator has no control over the variable, either because their manifestations have already occurred or they cannot be controlled or manipulated. The research can only report what has happened or what is happening [10:82].

Historical data is classified as secondary data, as opposed to primary data. Secondary data is information

originally collected for a purpose other than that being currently researched. "Primary data comes from the original source of materiel which the researcher seeks out; that is, he collects data that have not been previously collected [10:175]." The data used for our analysis, as implied by the term historical, had been previously collected and not for the same purpose as our study.

The advantages of using this secondary data are that it is more easily and generally obtainable. The major disadvantage being "the unavailability of data that will meet . . . specific research needs [10:176]." Though unavailability of certain data restricted the scope of this thesis, it was not a major problem. Later sections on research assumptions and limitations more fully address the research considerations due to the nature of the secondary data.

Other research design considerations were data validity, reliability and practicality. "Validity reflects the degree to which a measure actually measures what it purports to [20:43]." The data used is valid in that it is a representative sample of the population being measured and the variables chosen best represent those characteristics desired to be measured. "Reliability reflects the degree to which the results of measurement are free of error [20:43]." The data used is reliable in that it supplies consistent results. "Practicality is concerned with a

wide range of factors of economy, convenience, and interpretability. . . [10:120]." Practicality was met as our data source is the only one available, affordable and easily interpretable.

Chi-Square Goodness-of-Fit Test

Each scheduled payment in the LOA financial annex is a forecast of the total dollar value expected to deliver the following calendar quarter. The percentage of dollars to be collected was based on delivery data supplied by SAAC. Hence, payment schedule quantity dollar totals are assumed to be from the same population as quarterly delivered requisition dollar values. That payment schedule values have been accused as being inaccurate, places suspicion on this assumption. Therefore, this research team performed a statistical goodness-of-fit test to determine if payment schedules were really from the same population as requisition dollar deliveries. If they are not, then the distribution of payment schedules would differ from the delivered dollar distribution, resulting in inaccurate financial annexes.

The Chi-Square Goodness-of-Fit Test was selected because the data were already categorized by quarter. Actual dollars within each quarter (category or class) were used during the computer analysis since goodness-of-fit tests are based on frequencies, not proportions.

Chi-Square is an approximate test. To assure the quality of the approximation, expected value categories (payment schedule quarterly amounts) with values less than five were combined with other categories. Observed value categories (actual quarterly delivery dollars) were combined to have the same number of categories as the expected values. The test was performed for each sampled case.

Assumptions.

1. The sample is a simple random one from the population.

2. The sample size is reasonably large.

Hypothesis for Testing. The null hypothesis is that expected delivery values (quarterly payments for projected deliveries) have the same distribution (are from the same population) as the observed delivery values (actual quarterly delivery values). The alternate hypothesis is that the expected values and the observed values are distributed differently (are not from the same population).

Alpha Level. A .05 level of significance was chosen.

Decision Rule. The null hypothesis was rejected when the computed value of the test statistic for each case, was greater than its critical value. The test statistic

was the Chi-Square statistic with K-1 degrees of freedom. The degrees of freedom, for each case, was the number of categories (K), minus one.

Wilcoxon Matched-Pairs
Signed Rank Test

This test was performed to see if the median of the differences between payment schedule values and actual delivery values, within each quarter, was significantly different from zero. A sample of differences between the expected values (payment schedule) and observed values (actual deliveries), for all cases for each of the ten quarters, was taken and compared amongst themselves.

Assumptions.

1. The population of differences is continuous and symmetrical.

2. The n differences are a random sample from the population of differences.

Hypothesis for Testing. The null hypothesis is that the population median difference is zero. The alternative hypothesis is that the population median difference is not zero.

Alpha Level. A .05 level of significance was chosen.

Decision Rule. The null hypothesis was rejected when the test statistic Z value for each test was greater than its critical value.

Data Manipulation

The Statistical Analysis System (SAS), a series of preformulated computer programs designed for various statistical computations and analyses, was used to perform the various data manipulations on the IBM-ITEL Amdahl computer. The first of these analyses were frequency statistics based on numbers of requisitions. Other analyses were mean and variance statistics on ordering periods and delivery periods from requisition date to ship date. All of these statistics were used to facilitate variable categorizations. The three variables of interest were country, RIC, and DSC.

Country groupings were based on geopolitical code. Breakdown by country was decided upon, instead of case, because of time and computer resource constraints. It was also felt that country was a better variable than case for ordering pattern analysis, since a country's orders are based on urgency of need and budget constraints.

Individual values for RIC were grouped based on military department or defense agency. Each RIC value corresponds to a specific supply point, the first digit indicating the cognizant service or agency. The frequency statistics were the basis for the decision to group the

Air Force supply points as one category ("Air Force") or individual categories of ALCs (Air Logistics Centers). The variable DSC consisted of two groupings; one for procured items and one for items shipped from inventory. Frequency statistical computer output produced the individual DSC values involved.

Pattern Analysis

Histograms were produced for each variable of interest. These histograms were based on quarters (91.25 days) from case implementation date. Each quarter's value was by taking the percentage of the total case dollars (ordered or delivered) that quarter. Individual country patterns were grouped according to visual similarities into three major types.

Contingency table analysis, to be performed later, requires that attributes of the same variable be used for testing relationships. Therefore, the first pattern analysis was performed on the variable country. Histograms on ordering and delivery data (attributes) were executed. To keep the number of patterns to a minimum, and maintain the variable attribute requirement, all further pattern analysis used the ordering pattern results of the country variable. Each of the major pattern types became the basis for the next group of patterns. Histograms, for each of the ordering types, by RIC category, were executed for

ordering and delivery data. The third variable of interest, DSC, was executed as a subgroup of RIC by country ordering type. DSC was handled in this manner because the time period for delivery of inventory and procurement items can vary between supply points due to differing asset release criteria and procurement procedures. Another reason for using overall country ordering types to base RIC and DSC breakdowns is that when the country submits a requisition, it does so usually without knowing which supply point will ultimately handle the requisition or if the item will ship from stock or be procured.

Contingency Table Analysis

This two-dimensional matrix is used to investigate the existence of an association between two classifications (11). The Chi-Square test for independence was used to perform this analysis. Three separate analyses were performed: one between country ordering and delivery patterns, one between RIC ordering and delivery patterns obtained from the country ordering types, and one between the DSC ordering and delivery patterns obtained from each RIC category of each country ordering types. Every observation of a variable's ordering pattern type was matched with its corresponding delivery pattern type. These occurrences were summed into frequency counts. Calculations performed on the frequencies indicated whether the relationship was dependent or independent. Though the type of relationship

is not indicated, the strength of the relationship can be inferred from the size of the test statistic, Q. Q can be considered a measure of association between categories, in the sense that it is approximately equal to zero when the categories are independent, and that it increases when the relationship becomes less independent and more dependent (11).

Assumptions.

1. A simple random sample of size n has been selected from an infinite or large bivariate multinomial population.

2. The sample size n is reasonably large.

Hypothesis for Testing. The null hypothesis is that ordering type X is independent of delivery type Y, for each of the categories. The alternative hypothesis is that ordering pattern type X and delivery pattern type Y are dependent.

Alpha Level. As in the previous statistical tests, .05 level of significance was chosen.

Decision Rule. When the computed value of Chi-Square with (r-1)(c-1) degrees of freedom is greater than the critical value of the Chi-Square statistic, the null hypothesis is rejected. The degrees of freedom associated

with the critical value are calculated by multiplying the number of (rows minus 1) times the (number of columns minus 1).

CHAPTER IV

RESULTS AND ANALYSIS

Introduction

This chapter presents the results of the calculations and pattern analysis accomplished by our research methodology. Each research question is addressed and analyzed in management summaries and sections on technical analysis. The management summary is an analysis of the research results. The technical analysis section follows with statistical results, tables of values, and pattern and category descriptions.

Research Results--Question 1

Management Overview

The first question asked if payment schedules were an accurate predictor of actual deliveries. Sample data in payments and actual deliveries from sixteen cases were collected and two statistical tests performed to ascertain the answer. The first test was conducted on a case basis. In every instance, the null hypothesis that the schedule of payments from the financial annexes were distributed the same as actual deliveries, was rejected. Next, the error differences between scheduled payments and actual deliveries were tested to see if, in any particular

quarter, the errors over the cases were significantly different from zero. The second, seventh, and ninth quarters rejected the null hypothesis; which means that these quarters had differences significantly different from zero. However, over half of the quarters tested did not reject. In these quarters, the means of the summed errors were not significantly different from zero. This test indicated that for those quarters which failed to reject the null, the number and degrees of undercollection and overcollection tended to neutralize each other. It did not test the existence of errors.

Technical Analysis

Chi-Square Goodness-of-Fit Test. Every sample case tested rejected the null hypothesis. The results, degrees of freedom, critical values, and test statistics for each of the sixteen tests are given in Table 3. Based on the results of these tests, using a 0.05 level of significance, the research team is 95 percent confident that the population of expected deliveries (scheduled payments from the financial annexes) are not from the same distribution as the population of actual deliveries. Since these sample cases would also reject the null hypothesis at a lower level of significance (alpha equal to 0.01), it seems reasonable to conclude that payment schedules differ drastically from actual deliveries.

TABLE 3

CHI-SQUARE VALUES

Case	R/F	Statistic	Chi-Square Value	Reject
1	10	18.3	148.1	YES
2	10	18.3	112.5	YES
3	10	18.3	172.2	YES
4	8	15.5	221.4	YES
5	10	18.3	83.6	YES
6	10	18.3	967.7	YES
7	9	16.9	29.7	YES
8	10	18.3	50.4	YES
9	9	16.9	2467.2	YES
10	10	18.3	559.9	YES
11	10	18.3	281.3	YES
12	10	18.3	131.1	YES
13	10	18.3	193.9	YES
14	10	18.3	1031.2	YES
15	10	18.3	265.6	YES
16	10	18.3	674.7	YES

Wilcoxon Matched-Pairs Signed Rank Test. The results of this test, performed by quarters, were mixed. Quarters 2, 7, and 9 rejected the null hypothesis that the median difference between the scheduled payment and the actual quarterly payment was significantly different from zero. Quarters 3, 4, 5, 6, and 10 failed to reject the null hypothesis. Quarters 1 and 8, though officially rejecting the null, were so close to the critical value that this research team did not feel it practical to determine their significance. From the standpoint of practicality, the results of this test, though statistically significant, were not as important to the research question as the results of the Chi-Square test. The Wilcoxon Signed-Rank Test makes inferences about difference (errors) medians, while the research question seeks to determine if errors exist. Furthermore, the sample size was relatively small and there existed a question regarding the assumption of independence. Since the data tested was from consecutive quantities of deliveries, there would be dependence from one quarter to the next. Table 4 presents the findings of the computer analysis for the Wilcoxon Signed Rank Test.

Research Results--Question 2

Management Overview

The second research question was directed at the identification of visually discernable ordering and

TABLE 4

WILCOXON SIGNED RANK TEST VALUES
(Matched-Pairs)

Quarter	2-Value	2-Tailed P Value	Reject
1	-1.88	.059	NO*
2	-2.43	.015	YES
3	-0.49	.623	NO
4	-1.08	.278	NO
5	-0.03	.972	NO
6	-0.56	.570	NO
7	-2.10	.035	YES
8	-1.72	.084	NO*
9	-2.83	.005	YES
10	-0.66	.507	NO

*Rejected very closely.

delivery patterns. Order and delivery patterns identified would be grouped according to similarities and used for the contingency table analysis of the third research question. Data obtained from 468,885 requisitions would be grouped and analyzed three different ways. Overall, 106 "KB" and "R" cases were involved. First, the data were examined on the basis of individual country codes (a data element extracted from each requisition). Secondly, the RIC code from each requisition was identified and histograms produced for each previously identified category of RIC values within country ordering types. Lastly, each RIC category for each country ordering type was divided into two DSC subroups, and histograms produced for each subgroup for each RIC category. This was done to determine both ordering and delivery patterns.

Country Patterns. Visual analysis of country histograms resulted in three constant and distinct patterns. Figure 5 is a representation of the general patterns for each type. Type 1 has a peak dollar ordering period in the first quarter. Subsequent quarters reflect a continuing requisitioning decline. Type 2 reflects placed orders starting in the first quarter and building to an ordering peak in the second quarter. All orders after this period decline. In Type 3, all orders increase through the first two quarters and eventually peak at either the third or

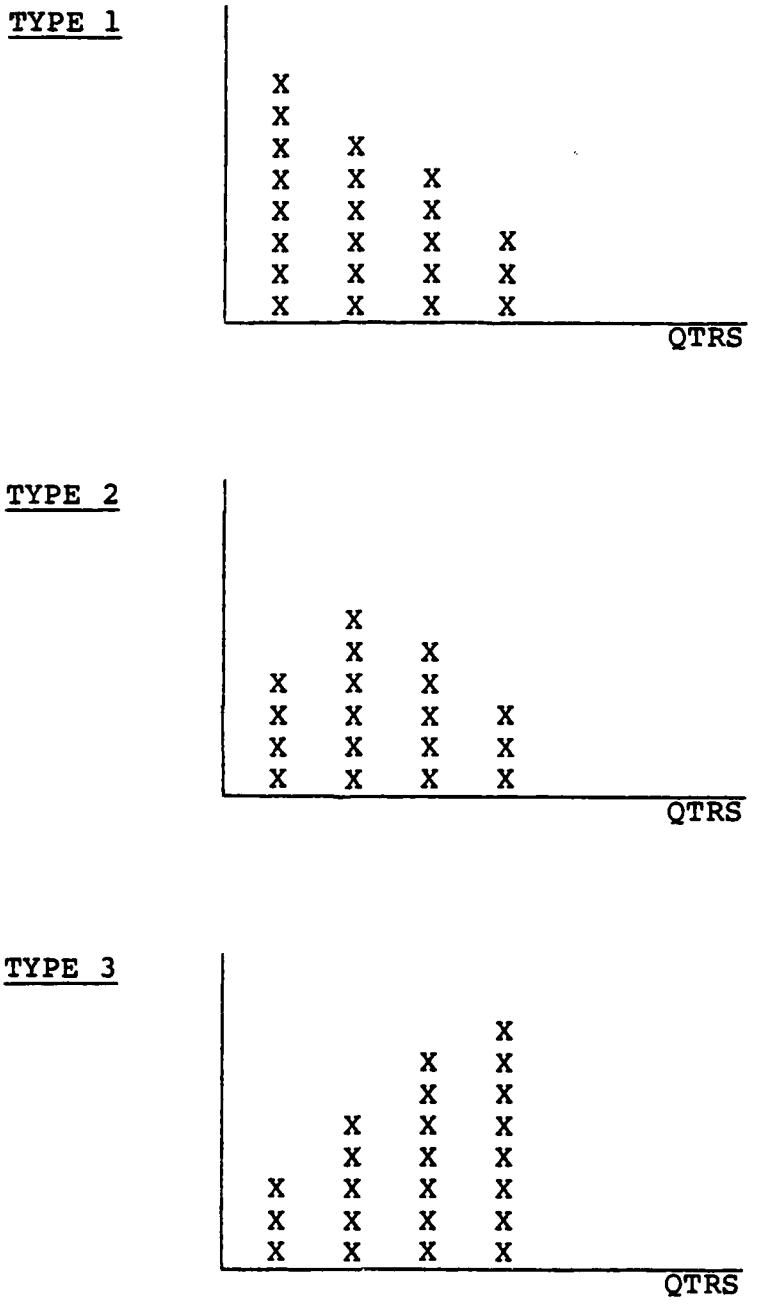

Fig. 5. Ordering Patterns (By Quarter)

fourth quarter. Thus, the heaviest ordering period by dollar value is the last part of the year requisitioning period.

Delivery pattern types covered much longer time spans due to the nature of FMS deliveries. Delivery types based on country resulted in the three basic delivery patterns. These are diagrammed in Figure 6. It should be noted though, that these histogram patterns were only similar in general shape. In the first type, the majority of the requisitioned dollars are delivered the first year and gradually decrease over successive quarterly periods. Type 2 deliveries replicated the first part of Type 1, but instead of trailing off, the deliveries once again peaked and ebbed. Type 3 deliveries were considered to be eratic. They consisted of many peaks and valleys spread over the delivery period. The shape and period of the peaks and valleys were not consistent.

A contingency table was developed for determining country ordering and delivery relationships by creating a matrix. Each ordering type headed a column and each delivery type designated a row. Every intersection of an ordering type and a delivery type designated a cell. Each time a country of ordering Type 1 was observed to have a particular delivery pattern, it was recorded in the cell under ordering Type 1 in the row belonging to the correct delivery type. This was accomplished for all types. Thus

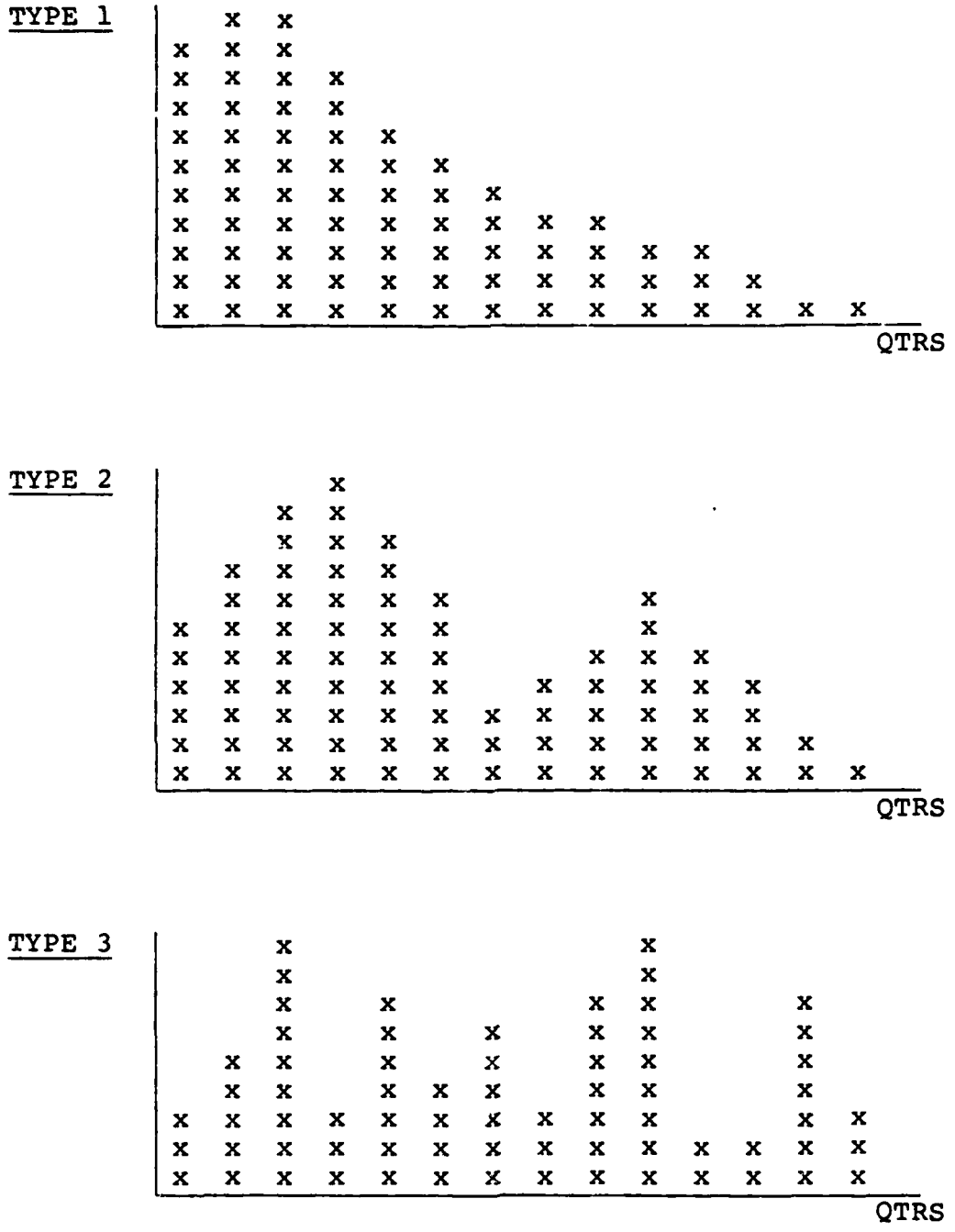

Fig. 6. Country Delivery Patterns (By Quarter)

all countries were represented and had to conform to both an ordering type and a delivery type. Table 8 (shown later in this chapter) is a visual representation of the results.

RIC Patterns. As discussed in Chapter III, the first ordering patterns analyzed and grouped were output by country. To insure that attributes of the same variable were typed and analyzed for contingency table analysis, and to preclude computer memory and space allocation limitations, country ordering types became the basis for all subsequent pattern analysis. That is, countries comprising each ordering type were combined in a computer program so that only three country groups existed where forty individual countries had before. Delivery and ordering histograms were produced for each RIC category for each new country group. The result was three patterns for each RIC category. Each of these patterns was coded according to country group (1, 2, or 3). The same observation recording process was followed as in the country contingency table. All ordering histograms, regardless of RIC category or producing type, were analyzed and grouped into new ordering patterns based on visual similarity. The process was repeated for delivery patterns.

All RIC ordering patterns replicated the patterns identified during country analysis (see Figure 5). RIC delivery pattern types are represented by Figure 7.

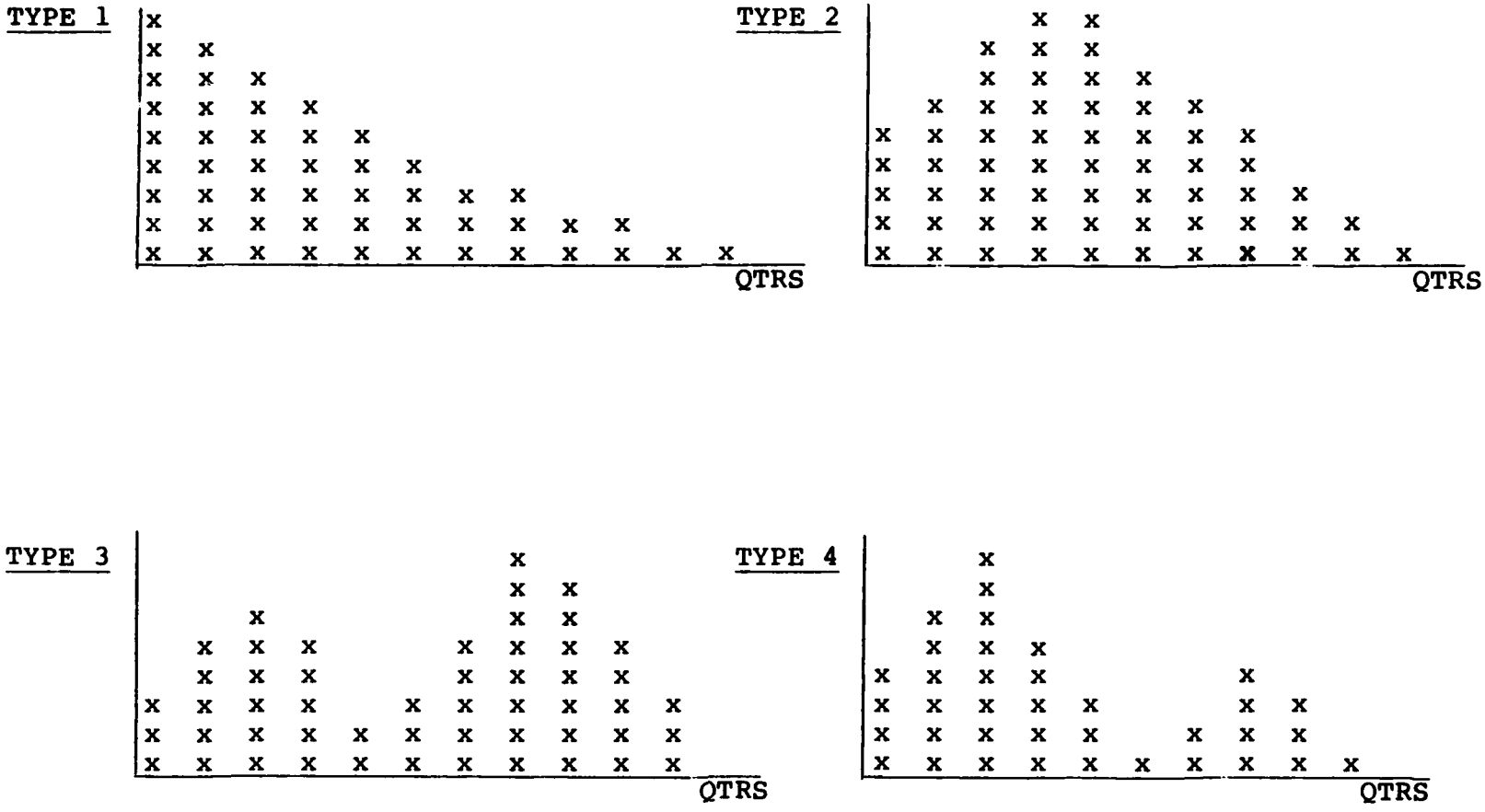

Fig. 7. RIC Delivery Patterns (By Quarter)

Delivery Type 1 replicated the classic pattern of peak deliveries in the first quarter, with a long gradual decline. Type 2 deliveries peaked at the end of the first year to the beginning of the second year. Deliveries built up to this peak and then gradually declined again. Types 3 and 4 had two distinct peaks. In Type 3, the second delivery peak, occurring at the end of the second year, was larger than the peak in the first year. In Type 4, the situation was reversed with the heaviest deliveries occurring in the first year followed by a smaller second peak on year 2 or 3.

For contingency table analysis, a three-by-four matrix was created. Again, ordering types formed the columns and the four delivery types became rows. Observations were again recorded for each ordering pattern next to the delivery pattern which had the same RIC categories and country type codes. Thus most RIC categories had three patterns for ordering and delivery (three observations each). Reference Table 9 (shown later in this chapter) for the observation results.

DSC Patterns. Histograms were obtained for the two DSC categories (inventory and procurement) for each RIC category (Army, Navy, DLA, Warner Robins, San Antonio, etc.) derived from the country types. Again, the resulting patterns were coded (1, 2, or 3) and grouped according to

visual similarities to produce ordering types and delivery types. A three-by-three contingency table was formed and observations recorded, matching the individually coded patterns within each type (see Table 10, shown later in this chapter).

Again, the resulting ordering patterns were similar to the country and RIC ordering patterns of Figure 5. Figure 8 shows the four types of DSC delivery patterns. The first had peak deliveries in quarters 1, 2, or 3 and gradually tapered down. The second peaked during quarters 4, 5, or 6. Deliveries increased, but were heaviest during the second year, and decreased thereafter. Type 3 replicated the previous pattern, except this time the peaks occurred between end of second year and the first part of the third. Type 4 deliveries continued to increase until the end of the third year. Instead of decreasing, the deliveries remained steady at the end of the period.

Analysis. Ordering pattern consistency was noted. During the RIC pattern analysis, the Type 3 (late ordering) pattern was composed of patterns produced by Type 3 countries. In the DSC patterns, the majority of each resulting ordering type was comprised of outputs based on the identical original country ordering type.

Another aspect of note is how certain RIC categories and DSC categories (inventory or procurement) were

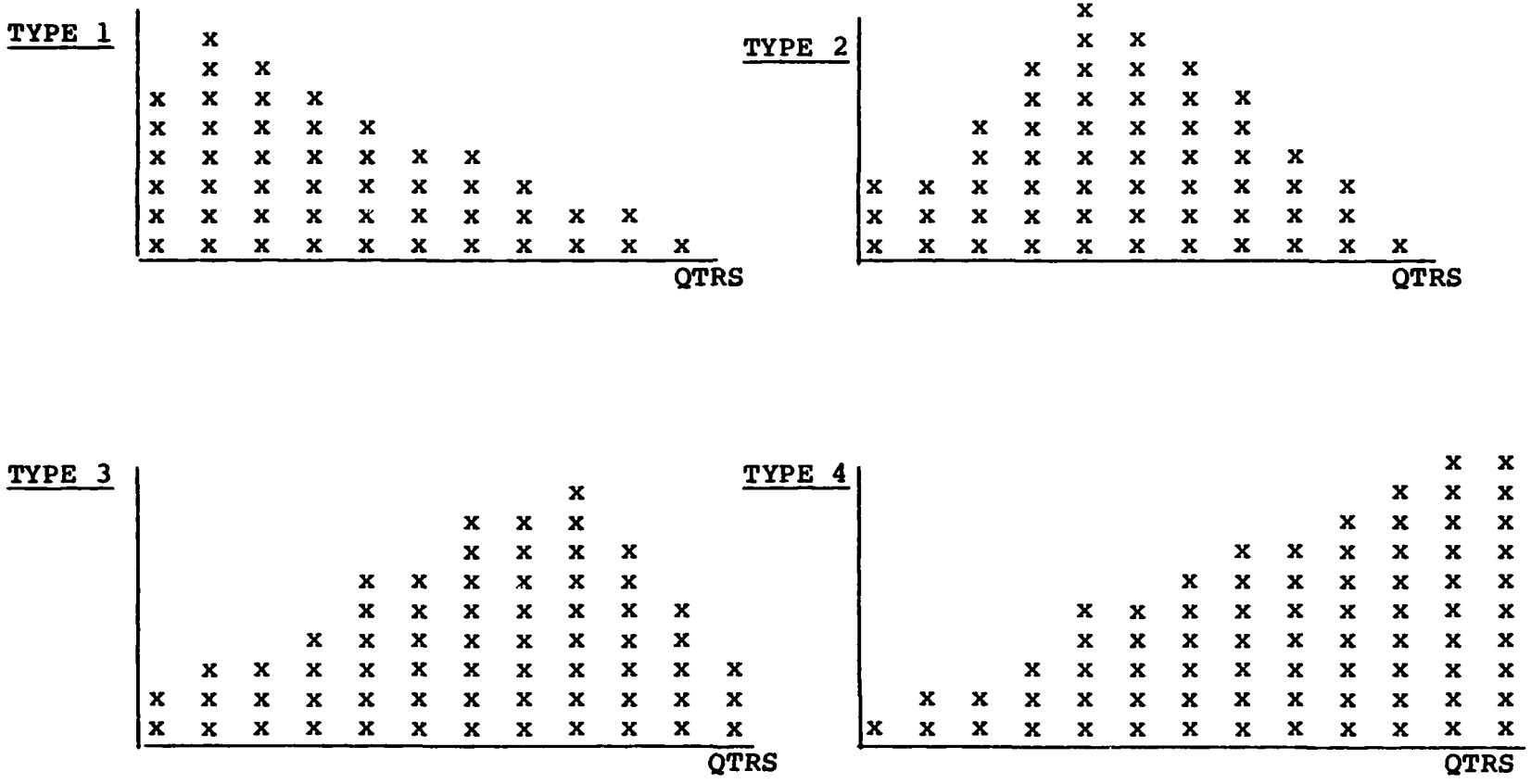

Fig. 8. DSC Delivery Patterns (By Quarter)

indicative of certain delivery patterns. All DLA and GSA deliveries had third or fourth quarter delivery peaks (RIC delivery Type 2). All GSA orders followed a constant ordering pattern of a second quarter peak, and gradually decreasing. DLA, on the other hand, had ordering patterns similar to each country ordering pattern. The Navy and four ALCs (Ogden, Warner Robins, San Antonio and Oklahoma City) delivered as RIC Type 3 patterns (major deliveries in the first year, followed by a decrease, an increase and second decrease).

The DSC pattern analysis revealed that the first two delivery pattern types were composed almost totally (all but two observations) of inventory patterns. All but one pattern in the last two types were procurement.

Technical Analysis

Country Patterns. Visual analysis of individual country histograms, as stated in the management review, resulted in three ordering types. These country groupings, represented in Table 5, were used as the basis for other variable pattern analysis. That is, histograms on RIC and DSC categories were run only for each ordering type, not for each country or case.

Categories. Requisition frequency computer statistics identified all RIC and DSC values (individual codes) applicable to the sample time span. Final RIC categories

TABLE 5

COUNTRIES BY ORDERING TYPE

Type 1	Type 2	Type 3
Austria	Ecuador	Australia
Brazil	France	Belgium
Canada	Indonesia	Denmark
Colombia	Netherlands	Egypt
Greece	Pakistan	Germany
Guatemala	Singapore	Japan
India	Taiwan	Kenya
Israel	Tunisia	Norway
Jordan		Peru
Lorea		United Kingdom
Malaysia		Venezuela
Morocco		
NATO		
New Zealand		
Philippines		
Portugal		
Saudi Arabia		
Sudan		
Thailand		
Turkey		
Zaire		

were the following: Army, Navy, Marines, DLA, GSA, Warner Robins ALC, Sacramento ALC, San Antonio ALC, Ogden ALC and Oklahoma City ALC. Other RIC codes, and codes which appeared to be input erroneously, comprised only 0.01 percent of the sample population. DLA RIC code accounted for approximately 80 percent of all requisitions. This appears to be somewhat higher than normal, but is probably due to the use of open cases instead of delivery complete cases. A normal "KB" or "R" case takes at least fifteen quarters for all requisitions to deliver and often have a few outliers which take longer. Since the collection period for sample cases was chosen to provide at least ten quarters of data per case, and the data collected was only for delivered requisitions, a majority of the sample requisitions only represent the first ten to twelve quarters of the case delivery period. Since computer statistics on the mean number of days taken to fill an order, on each of the categories, indicated that the DLA fill time was shorter than the ALCs and other services,[5] more of their requisitions would be expected to show up in this particular data sample.

The last variable of interest, DSC, was categorized according to whether the individual value indicated the

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[5]This is primarily because DLA-managed items are small dollar value, high turnaround items (consumables or EOQ items).

item was supplied from inventory or was procured. Table 6 lists the individual DSC values (codes) and interpretations for the procurement category. Table 7 lists the same for the inventory grouping. One DSC, "89," was deleted because it accounted for less than 0.001 percent of the number of requisitions and represented only "service costs applicable to assignment of National Stock Numbers to nonstandard items for FMS customers [1:3]."

Analysis. During the execution of the pattern analysis, it became apparent to this research team that all of the delivered requisitions against many of the sampled cases were not in the data set provided by SAAC. Perhaps it is because the requisitions were not available on the recommended FKA tapes or the SAAC data base was incomplete. However, our sample size (468,885) spread over 106 cases allows for a calculated average of 4,423 requisitions per case. Thus, we feel that a statistically significant sample for a majority of the cases has been collected. In reality, a sample size any larger would have been beyond the capabilities of the computer resources available for this study.

During the course of the pattern analysis, several patterns were deleted. There were several Marine RIC and DSC histograms and DLA procurement histograms which had undefinable patterns. The accumulative percentages for each histogram were less than .0190.

TABLE 6

PROCUREMENT DELIVERY SOURCE CODES (1; 14)

Code	Interpretation
AC, AD, 15, 16	Nonexcess stock fund or secondary item shipped from contractor plant for a FMSO requirement.
DA	Contractor Service.
DB, 54	Direct shipment of stock fund items from contractor.
DC	Direct shipment of secondary item from contractor.
DD	Direct shipment of principle or major item from contractor.

TABLE 7

INVENTORY DELIVERY SOURCE CODES (1; 14)

Code	Interpretation
AA, AB, 12, 13, 17	Air Force owned stock fund or secondary item shipped from nonexcess inventory for a FMSO requirement.
EF, 18, 66	Other federal agency shipments from stock.
74	Shipment of serviceable replacement item for reparable item received from FMS customer under the Materiel Return Program.
99	Training provided within DOD to FMS students against AFLC managed FMS cases.

Research Results--Question 3

Management Overview

The last research question concerned the existence of a relationship between ordering and delivery patterns. Contingency table analysis utilizing Chi-Square statistics, was used to obtain the answer. The pattern types developed in the previous section were assigned to row-by-column matrices. A table (matrix) was developed for each variable: country, RIC and DSC. Observations were recorded for each occurrence of a particular delivery pattern with a particular ordering pattern (see Tables 8, 9, and 10). These observed values when compared to the Chi-Square expected, statistically determined if a relationship between the row (delivery) and column (ordering) types did not exist.

There was no significant discernable relationship between country ordering and delivery patterns for the sample of forty countries. Ordering and delivery patterns developed on either RIC or DSC, however, indicated a statistically relevant dependent relationship. The type of relationship is not discernable by this test.

Technical Analysis

The contingency table for country patterns contained cells with expected values less than five. To maintain the Chi-Square statistic validity, cells were combined.

TABLE 8

COUNTRY CONTINGENCY TABLE OBSERVATIONS

Delivery Type	Ordering Type		Totals
	1	2	
1	10	10	20
2	11	9	20
Totals	21	19	40

TABLE 9

RIC CONTINGENCY TABLE OBSERVATIONS

Delivery Type	Ordering Type			Totals
	1	2	3	
1	29	0	0	29
2	21	48	22	91
3	42	0	33	75
4	71	75	11	157
Totals	163	123	66	352

TABLE 10

DSC CONTINGENCY TABLE OBSERVATIONS

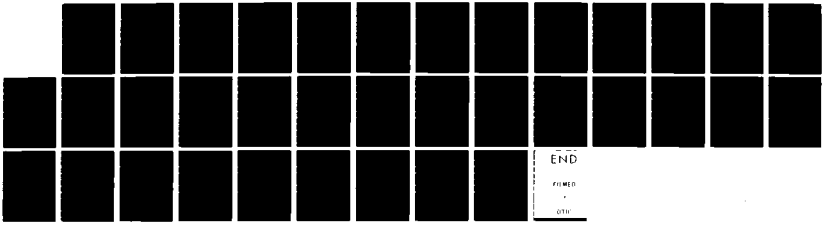
Delivery Type	Ordering Type			Totals
	1	2	3	
1	140	37	22	199
2	74	57	86	217
3	63	40	44	147
4	42	8	11	61
Totals	319	142	163	624

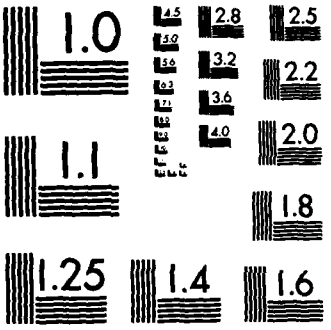
Ordering Types 2 and 3 were merged, as were delivery Types 1 and 2 to form a two-by-two matrix. The null hypothesis failed to reject because the calculated value, 0.1, was less than the critical value of 3.84 at one degree of freedom. We therefore could not reject the null hypothesis that ordering and delivery patterns by country are independent of one another. A larger sample size might be needed to further test this relationship.

The table for RIC patterns was a three-by-four matrix: three ordering patterns and four distinct delivery patterns. We rejected the null hypothesis concluding that ordering and delivery patterns by RIC are dependent on each other since the calculated value of 126.13 was greater than the critical Chi-square value of 12.59 at six degrees of freedom. The dependent relationship can be inferred as fairly strong since the calculated value of Chi-square is high.

The final table, DSC, was a three-by-four matrix. It also rejected the null hypothesis by a large value. The test statistic was 73.68, greater than the critical value of 12.59 at six degrees of freedom.

AD-A123 771 AN EXPLORATORY ANALYSIS OF FMS DELIVERY DATA TO IMPROVE 2/2
BLANKET ORDER PAY..(U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH SCHOOL OF SYST..
UNCLASSIFIED L B HANDLEY ET AL. SEP 82 AFIT-LSSR-22-82 F/G 5/1 NL





CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Introduction

This final chapter presents the conclusions derived from the research results documented in Chapter IV. They are followed by recommendations for management action and future research. A final summary concludes the chapter.

Conclusions

Goal 1

Payment schedules, when measured on a total case basis, are not accurate. The scheduled payments are not forecasting or portraying actual deliveries. It also appears that there is little consistency in the degree or direction (underpayment or overpayment) of payment schedules.

Goal 2

Identifiable ordering and delivery patterns do exist in FMS blanket order case delivery data. Distinct ordering patterns can be discerned at country, RIC and DSC levels. Delivery patterns, at the country level, are not as distinct as the ordering patterns. This is probably due to the many influencing factors inherent on the DOD

supply system. Two of these factors, DSC and RIC, produced identifiable delivery patterns themselves when viewed as the primary variable. We can conclude, then, that while FMS country delivery patterns are only similar in very general terms, distinct delivery patterns can be identified when influencing variables are viewed separately.

Goal 3

A relationship does exist between FMS blanket order delivery and ordering patterns. Though this research team was unable to prove a dependent relationship between country ordering patterns and resulting deliveries, dependent relationships between RIC and DSC orders and deliveries were discovered.

Recommendations for Management Action

Recommendation 1

This thesis has performed exploratory analysis to determine the existence of certain dependent relationships between FMS orders and deliveries. This should provide a basis on which an algorithm can be developed to incorporate this information into payment schedule computations. The same algorithms could be used to annually revise payment schedules since certain ordering and delivery data would be known.

Recommendation 2

This research team recommends the automation of payment schedules. The model or algorithm base should allow for management input which would allow for a more individualized payment schedule. Further, case managers should be encouraged to use their knowledge of country ordering trends to provide a more accurate schedule. For example, knowledge that a prior case will continue to be requisitioned against even after a new case has been implemented as a replacement should be used to lower the first scheduled payment since initial requisitioning would most probably be lower than normal. Knowledge of a country's weapon systems and who manages the system would produce a more accurate payment schedule if the applicable RIC delivery patterns are used as the computational basis.

Recommendation 3

This research team joins the previously cited DAS report in a recommendation that increased attention be directed to audit trail procedures. This research team encountered many incorrectly input codes and many useful fields of data left totally blank. Further, considering the increased attention focused on FMS financial management, a review of all codes to determine what information should be collected and retained for future research and other needs, could prove advantageous.

Recommendations for Further Research

This research was an exploratory study of FMS blanket order case delivery data. The scope and time constraints placed upon this effort made it impossible for this thesis team to fully research and analyze the entire area of FMS blanket order delivery behavior. We feel that there are many opportunities and a need for further research efforts to more fully study and characterize ordering and delivery behavior and relationships in the area of FMS blanket order cases. As these studies could further improve and otherwise enhance FMS case financial management, this thesis team highly recommends and encourages such efforts to improve the FMS program.

Recommendation 1

Recommend that further statistical research be performed to determine the strength and specific type of relationships which exist. We feel that this information will greatly facilitate efforts to mechanize and otherwise improve the accuracy of FMS payment schedules.

Recommendation 2

We also recommend that a model be developed for creating FMS blanket order payment schedules which incorporates the findings of this thesis and those findings from other appropriate research efforts, like that of the aforementioned. Such a model could not only be used to

verify our own research findings via similation, but could greatly assist the mechanizing of more accurate payment schedules.

Recommendation 3

Since, as previously stated, this was a limited exploratory research effort, this team suggests that other exploratory research efforts be performed to fully analyze the area of FMS blanket order payment schedules. Such research should include the use of other variables which might impact case deliveries, such as "fund codes" and "CLSSA program codes." Because there are many factors which can influence a requisitioned item's delivery, we feel that this thesis has examined only a small fraction of possible variables impacting case deliveries and that other similar studies should be undertaken to fully research this area.

Furthermore, similar studies could research other types of blanket order, defined order and system package cases using data from both the H051 and SAAC computer systems. Also, since our research only examined AFLC-managed cases, similar studies could be undertaken to examine cases managed by other military departments, such as the Navy, Army, DLA, and other Air Force agencies.

Summary

The intent of this thesis was to determine, by performing exploratory analysis, if relationships and variables exist which could better describe delivery behavior than the existing payment schedule percentage tables. During the course of this research effort, it was determined that existing payment schedules do not accurately forecast deliveries, and subsequently do not produce accurate payments for these deliveries. Results of this thesis show that distinct relationships between ordering patterns and resulting delivery patterns do exist and can be used to compute more accurate payment schedules. However, there is not one clear-cut relationship or pattern appropriate for all countries and cases.

In reality then, the problem of payment schedules is one of the priorities and available resources. The ILC, by using percentages based on historical case delivery data, is putting more effort into computing accurate blanket order payment schedules than the other military services. The percentages they are using are most likely legitimate averages. However, the fluctuations of overall delivery patterns are so wide, that by using an average, the vast majority of payment schedules will never be accurate. Accuracy for individual countries and cases can only be achieved through individualized payment schedules. To develop the rationale, and calculate and maintain

individualized payment schedules, manually or mechanically, requires effort, resources and the support and interest of those who created the requirement.

APPENDICES

APPENDIX A

GLOSSARY OF TERMS

Blanket Order FMS Case--a case established for a category of items or services with no definitive listing of specific items or quantities. The case specifies a dollar ceiling against which the purchaser may place orders throughout the validity period defined in the case (24:A1-3).

Case--a contractual sales agreement between the U.S. and an eligible foreign country or international organization documented by DD Form 1513. One FMS case designator is assigned for the purpose of identification, accounting and data processing for each accepted offer (DD Form 1513) (22:v).

Case Designator--a unique designator assigned by the implementing agency to each Foreign Military Sales case. The designator originates with the offer of a sale, identifies the case through all subsequent transactions, and is generally a three-letter designation (22:v).

Case Manager--the individual assigned to negotiate, prepare, and process Letters of Offer and Acceptance (LOAs) and their amendments or modifications, and to direct implementation of the FMS case. This individual also monitors the progress of actions taken in meeting case requirements, including the timely availability of case funds to the implementing command (24:A1-1).

Cooperative Logistics Supply Support Arrangement--the arrangement under which logistics support is provided to a foreign government through its participation in the U.S. Department of Defense logistics system with reimbursement to the U.S. for support performed (22:vi).

Defined Order Case--a case for purchasing specific quantities of defined items or services (as opposed to a blanket order case) (24:A1-3).

Follow-on Support--recurring support required to maintain the operational status of the system/major item (22:vi).

Foreign Military Sales--the selling of military equipment and services to friendly foreign governments and international organizations under the authority of the Foreign Military Sales Act of 1968, amended (22:vii).

Generic Code--a three-digit alpha/numeric code which represents the type of materiel or services according to budget activity/project account classification (22:vii).

Implementing Agency--the Military Department or Defense Agency assigned responsibility by the Defense Security Assistance Agency to prepare a DD Form 1513 and to implement the FMS case. The implementing agency is responsible for overall management of the actions which will result in delivery of the materials or services set forth in the Letter of Offer and Acceptance (DD Form 1513) which was accepted by a foreign country or international organization (26:B-3).

Letters of Offer and Acceptance--U.S. DOD Offer and Acc t-ance (DD Form 1513) contains an offer of the sale o items or services, with estimated costs and conditi - (24:A1-4).

Payment Schedule--list of dollar amounts and when they a.. due from the foreign customer. The payment schedule supplements the LOA when presented to the customer. After acceptance of the LOA, the payment schedule serves as the basis for billings to the customer (23:A1-5).

Price and Availability (P&A) Study--the effort required to prepare P&A data (estimated dollar cost and estimated delivery dates) for an LOA (24:A1-5).

Programmed Demand--demand (requisition) for an item for which a stock level forecast has been incorporated into the applicable requirements computation for a sufficient period of time that depot stocks have been increased in anticipation of the demand. Programmed demands are given access to on-hand depot stocks (22:vi).

Spare--an individual part, subassembly, or assembly supplied for the maintenance or repair of systems or equipment (14:A1-6).

APPENDIX B

SPSS PROGRAM FOR CHI-SQUARE GOODNESS-OF-FIT TESTS

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 100=RUN NAME        FMS PMT SCHEDULE ASSESMT
110=VARIABLE LIST   CD1,CV1
120=INPUT MEDIUM    DISK
130=INPUT FORMAT    FREEFIELD
140=WEIGHT          CV1
150=N OF CASES      11
160=NPAR TESTS      CHI-SQUARE= CD1/
170=                CHI-SQUARE= CD1/ EXPECTED= 33.27,
180=                39.32,36.29,21.17,21.17,24.20,
190=                21.17,18.15,15.12,15.12,57.47/
200=OPTIONS         5
210=READ INPUT DATA
220=FINISH
```

APPENDIX C

SPSS PROGRAM FOR WILCOXON MATCHED-PAIRS SIGNED RANK TESTS

```
 100=RUN NAME       FMS PC' SCHEDULE ASSESMT
110=VARIABLE LIST  CE1 TO CE10,CA1 TO CA10
120=INPU' MEDIUM   DISK
130=INPUT FORMAT   FREEFIELD
140=N OF CASES     16
150=COMPUTE        D1 = CE1 - CA1
160=COMPUTE        D2 = CE2 - CA2
170=COMPUTE        D3 = CE3 - CA3
180=COMPUTE        D4 = CE4 - CA4
190=COMPUTE        D5 = CE5 - CA5
200=COMPUTE        D6 = CE6 - CA6
210=COMPUTE        D7 = CE7 - CA7
220=COMPUTE        D8 = CE8 - CA8
230=COMPUTE        D9 = CE9 - CA9
240=COMPUTE        D10 = CE10 - CA10
350=FREQUENCIES    GENERAL= D1 TO D10
360=STATISTICS     1,3,4,5,6,9,10,11
370=OPTION         3,5,8
380=FREQUENCIES    GENERAL= D1 TO D10
390=STATISTICS     1,3,4,5,6,10,11
400=OPTION         3,5
410=NPAR TESTS     WILCOXON= CA1 WITH CE1/
420=               CA2 WITH CE2/CA3 WITH CE3/
430=               CA4 WITH CE4/CA5 WITH CE5/
440=               CA6 WITH CE6/CA7 WITH CE7/
450=               CA8 WITH CE8/CA9 WITH CE9/
460=               CA10 WITH CE10/
470=OPTIONS        5
480=READ INPUT DATA
490=FINISH
500=*EOR
```

APPENDIX D

SAS PROGRAM FOR DATA MANIPULATION

```
//CWKIN JOB (1103,L31),CWAL,MSGLE,EL=(1,1),                    X
// REGION=500K,TIME=60,CLASS=E
/*MESSAGE MOUNT X00801 FOR 250138
// EXEC SAS
//INF DD DSN=CHUCK,UNIT=TAPE,VOL=SER=250138,
// DISP=(OLD,KEEP),
// LABEL=(,NL),DCB=(RECFM=FB,LRECL=34,BLKSIZE=31960,DEN=3)
DATA CHUCK;
  INFILE INF;
  INPUT R1 $ 1 R2 $ 1-2 RIC $ 1-3
  PRC $ 4 CTRY $ 5-6 RTR $ 7 RQ $ 8-10
  C1 $ 11 CASE $ 11-13 DSC $ 14-15
  TS 16 SP 17-19 XVAL 20-28;
  IF RTR EQ  B  THEN DELETE;
  ELSE TR = INPUT(RTR,1.0);
  IF CTRY EQ  IR  THEN DELETE;
  IF CTRY EQ  BM  THEN DELETE;
  IF CTRY EQ  HO  THEN DELETE;
  IF CTRY EQ  JA  AND CASE EQ  RBE  OR
  CTRY EQ  JA  AND CASE EQ  RBM  OR
  CTRY EQ  JA  AND CASE EQ  RBL  THEN DELETE;
  IF CTRY EQ  KS  AND CASE EQ  RAF  THEN DELETE;
  IF CTRY EQ  UK  AND CASE EQ  RAR  OR
  CTRY EQ  UK  AND CASE EQ  RAS  OR
  CTRY EQ  UK  AND CASE EQ  RAT  OR
  CTRY EQ  UK  AND CASE EQ  RAU  THEN DELETE;
  IF DSC EQ  89  THEN DELETE;
  IF R1 EQ  C  OR R1 EQ  D  OR
  R1 EQ  E  OR R1 EQ  J  OR
  R1 EQ  X  OR R1 EQ  0  OR
  R1 EQ  4  OR R1 EQ  5  OR
  R1 EQ  8  OR R1 EQ  9  THEN DELETE;
  IF R1 EQ  L  THEN DELETE;
  IF R1 EQ     THEN DELETE;
  IF R2 EQ  FN  THEN DELETE;
  IF R2 EQ  FF  THEN RIC =  CAL ;
  IF R2 EQ  FG  THEN RIC =  DGD ;
  IF R2 EQ  FH  THEN RIC =  DHC ;
  IF R2 EQ  FL  THEN RIC =  CWR ;
  IF R2 EQ  FP  THEN RIC =  TAS ;
  IF DSC EQ  AA  OR DSC EQ  AB  OR
  DSC EQ  EF  OR DSC EQ  12  OR
  DSC EQ  13  OR DSC EQ  17  OR
  DSC EQ  66  OR DSC EQ  74  OR
  DSC EQ  78  OR DSC EQ  99  THEN DO;
  DSC =  IV ;
  END;
  IF DSC EQ  AC  OR DSC EQ  AD  OR
  DSC EQ  DA  OR
```

```
OSC EQ  08  OR OSC EQ  0C  OR
OSC EQ  0D  OR OSC EQ  15  OR
OSC EQ '16' OR OSC EQ  54  THEN DO;
OSC =  FR ;
END;
IF CTRY EQ  AT  AND CASE EQ '88' THEN DO;
  ITR = 8;
  IDT = 172;
  TVAL = 15350850;
END;
IF CTRY EQ  AT  AND CASE EQ 'BC' THEN DO;
  ITR = 9;
  IDT = 177;
  TVAL = 19422116;
END;
IF CTRY EQ 'AU' AND CASE EQ  8AM  THEN DO;
  ITR = 9;
  IDT = 035;
  TVAL = 1367a7;
END;
IF CTRY EQ  BE  AND CASE EQ  KBE  THEN DO;
  ITR = 8;
  IDT = 052;
  TVAL = 400000;
END;
IF CTRY EQ  BE  AND CASE EQ  KBF  THEN DO;
  ITR = 9;
  IDT = 003;
  TVAL = 1327b44;
END;
IF CTRY EQ  BR  AND CASE EQ  KBB  THEN DO;
  ITR = 8;
  IDT = 024;
  TVAL = 1000000;
END;
IF CTRY EQ  BR  AND CASE EQ  KBC  THEN DO;
  ITR = 8;
  IDT = 2a3;
  TVAL = 1500000;
END;
IF CTRY EQ  BR  AND CASE EQ  8AM  THEN DO;
  ITR = 8;
  IDT = 2a8;
  TVAL = 1a38f5;
END;
IF CTRY EQ  BR  AND CASE EQ  8AN  THEN DO;
  ITR = 8;
  IDT = 2a3;
  TVAL = 100000;
END;
```

```
IF CTRY EQ 'BR' AND CASE EQ 'RAP' THEN DO;
  IYR = 8;
  IDT = 360;
  TVAL = 255000;
END;
IF CTRY EQ 'CN' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT = 030;
  TVAL = 2264842;
END;
IF CTRY EQ 'CN' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 086;
  TVAL = 15981624;
END;
IF CTRY EQ 'CN' AND CASE EQ 'KBE' THEN DO;
  IYR = 9;
  IDT = 084;
  TVAL = 16127088;
END;
IF CTRY EQ 'CN' AND CASE EQ 'RAP' THEN DO;
  IYR = 8;
  IDT = 053;
  TVAL = 86000;
END;
IF CTRY EQ 'CN' AND CASE EQ 'RAR' THEN DO;
  IYR = 9;
  IDT = 114;
  TVAL = 42000;
END;
IF CTRY EQ 'CO' AND CASE EQ 'KBA' THEN DO;
  IYR = 7;
  IDT = 288;
  TVAL = 1038710;
END;
IF CTRY EQ 'CO' AND CASE EQ 'RAK' THEN DO;
  IYR = 7;
  IDT = 298;
  TVAL = 2814218;
END;
IF CTRY EQ 'CX' AND CASE EQ 'KBA' THEN DO;
  IYR = 8;
  IDT = 150;
  TVAL = 1179237;
END;
IF CTRY EQ 'CX' AND CASE EQ 'KBB' THEN DO;
  IYR = 9;
  IDT = 033;
  TVAL = 1000000;
END;
```

```
IF CTRY EQ 'CX' AND CASE EQ 'K3C' THEN DO;
  IYR = 9;
  IDT = 249;
  TVAL = 2000000;
END;
IF CTRY EQ 'DE' AND CASE EQ 'KBK' THEN DO;
  IYR = 8;
  IDT = 013;
  TVAL = 2475000;
END;
IF CTRY EQ 'DE' AND CASE EQ 'KBL' THEN DO;
  IYR = 8;
  IDT = 289;
  TVAL = 2475000;
END;
IF CTRY EQ 'EC' AND CASE EQ 'KBB' THEN DO;
  IYR = 7;
  IDT = 293;
  TVAL = 150000;
END;
IF CTRY EQ 'EC' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 206;
  TVAL = 177869;
END;
IF CTRY EQ 'EG' AND CASE EQ 'KBA' THEN DO;
  IYR = 9;
  IDT = 295;
  TVAL = 456105;
END;
IF CTRY EQ 'EG' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT= 017;
  TVAL = 780352;
END;
IF CTRY EQ 'EG' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 060;
  TVAL = 325000;
END;
IF CTRY EQ 'EG' AND CASE EQ 'KBD' THEN DO;
  IYR = 9;
  IDT = 183;
  TVAL = 3500000;
END;
IF CTRY EQ 'FR' AND CASE EQ 'KAM' THEN DO;
  IYR = 8;
  IDT = 124;
  TVAL = 100000;
END;
```

```
IF CTRY EQ 'FR' AND CASE EQ 'RAJ' THEN DO;
  IYR = 9;
  IDT = 005;
  TVAL = 202785;
END;
IF CTRY EQ 'IS' AND CASE EQ 'RBC' THEN DO;
  IYR = 8;
  IDT = 208;
  TVAL = 50000;
END;
IF CTRY EQ 'GR' AND CASE EQ 'KBE' THEN DO;
  IYR = 7;
  IDT = 340;
  TVAL = 16839071;
END;
IF CTRY EQ 'GR' AND CASE EQ 'KBF' THEN DO;
  IYR = 8;
  IDT = 335;
  TVAL = 23739115;
END;
IF CTRY EQ 'GR' AND CASE EQ 'RAM' THEN DO;
  IYR = 8;
  IDT = 307;
  TVAL = 11000000;
END;
IF CTRY EQ 'IS' AND CASE EQ 'RBD' THEN DO;
  IYR = 9;
  IDT = 201;
  TVAL = 2629108;
END;
IF CTRY EQ 'GT' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT = 150;
  TVAL = 493941;
END;
IF CTRY EQ 'GT' AND CASE EQ 'KBC' THEN DO;
  IYR = 9;
  IDT = 194;
  TVAL = 674502;
END;
IF CTRY EQ 'GY' AND CASE EQ 'KBN' THEN DO;
  IYR = 7;
  IDT = 349;
  TVAL = 20859613;
END;
IF CTRY EQ 'GY' AND CASE EQ 'KBP' THEN DO;
  IYR = 8;
  IDT = 290;
  TVAL = 23000000;
END;
```

```
IF CTRY EQ 'ID' AND CASE EQ 'KBA' THEN DO;
  IYR = 9;
  IDT = 242;
  TVAL = 1250000;
END;
IF CTRY EQ 'ID' AND CASE EQ 'RAD' THEN DO;
  IYR = 8;
  IDT = 125;
  TVAL = 525000;
END;
IF CTRY EQ 'ID' AND CASE EQ 'RAE' THEN DO;
  IYR = 9;
  IDT = 242;
  TVAL = 1033514;
END;
IF CTRY EQ 'IN' AND CASE EQ 'RAN' THEN DO;
  IYR = 8;
  IDT = 092;
  TVAL = 657276;
END;
IF CTRY EQ 'IN' AND CASE EQ 'RAP' THEN DO;
  IYR = 8;
  IDT = 090;
  TVAL = 441295;
END;
IF CTRY EQ 'IN' AND CASE EQ 'RAR' THEN DO;
  IYR = 9;
  IDT = 020;
  TVAL = 657276;
END;
IF CTRY EQ 'IN' AND CASE EQ 'RAS' THEN DO;
  IYR = 9;
  IDT = 020;
  TVAL = 440312;
END;
IF CTRY EQ 'IS' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 074;
  TVAL = 9500000;
END;
IF CTRY EQ 'IS' AND CASE EQ 'KBD' THEN DO;
  IYR = 8;
  IDT = 129;
  TVAL = 10229401;
END;
IF CTRY EQ 'IS' AND CASE EQ 'KBE' THEN DO;
  IYR = 9;
  IDT = 093;
  TVAL = 15750000;
END;
```

```
IF CTRY EQ 'IS' AND CASE EQ 'R3B' THEN DO;
  IYR = 8;
  IDT = 068;
  TVAL = 1100000;
END;
IF CTRY EQ 'JA' AND CASE EQ 'RBK' THEN DO;
  IYR = 9;
  IDT = 226;
  TVAL = 465487;
END;
IF CTRY EQ 'JA' AND CASE EQ 'RBG' THEN DO;
  IYR = 8;
  IDT = 192;
  TVAL = 322197;
END;
IF CTRY EQ 'JO' AND CASE EQ 'RAT' THEN DO;
  IYR = 8;
  IDT = 141;
  TVAL = 60000;
END;
IF CTRY EQ 'JO' AND CASE EQ 'RAU' THEN DO;
  IYR = 9;
  IDT = 236;
  TVAL = 340000;
END;
IF CTRY EQ 'KE' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT = 179;
  TVAL = 1650000;
END;
IF CTRY EQ 'KE' AND CASE EQ 'KBC' THEN DO;
  IYR = 9;
  IDT = 166;
  TVAL = 1750000;
END;
IF CTRY EQ 'KS' AND CASE EQ 'KBE' THEN DO;
  IYR = 8;
  IDT = 170;
  TVAL = 31609128;
END;
IF CTRY EQ 'KS' AND CASE EQ 'KBF' THEN DO;
  IYR = 8;
  IDT = 074;
  TVAL = 14025573;
END;
IF CTRY EQ 'KS' AND CASE EQ 'KBG' THEN DO;
  IYR = 9;
  IDT = 038;
  TVAL = 62117876;
END;
```

```
IF CTRY EQ 'AF' AND CASE EQ 'KBD' THEN DO;
  IYR = 9;
  IDT = 130;
  IVAL = 2500000;
END;
IF CTRY EQ 'AO' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 115;
  IVAL = 1605833;
END;
IF CTRY EQ 'AO' AND CASE EQ 'KBD' THEN DO;
  IYR = 9;
  IDT = 108;
  IVAL = 2000000;
END;
IF CTRY EQ 'AE' AND CASE EQ 'KBK' THEN DO;
  IYR = 7;
  IDT = 364;
  IVAL = 1907000;
END;
IF CTRY EQ 'AE' AND CASE EQ 'KBL' THEN DO;
  IYR = 9;
  IDT = 015;
  IVAL = 2799840;
END;
IF CTRY EQ 'AO' AND CASE EQ 'KBM' THEN DO;
  IYR = 8;
  IDT = 081;
  IVAL = 3303000;
END;
IF CTRY EQ 'AO' AND CASE EQ 'KBP' THEN DO;
  IYR = 9;
  IDT = 010;
  IVAL = 3300000;
END;
IF CTRY EQ 'AZ' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT = 054;
  IVAL = 600000;
END;
IF CTRY EQ 'AZ' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 146;
  IVAL = 989762;
END;
IF CTRY EQ 'AZ' AND CASE EQ 'KBD' THEN DO;
  IYR = 9;
  IDT = 087;
  IVAL = 800000;
END;
```

```
IF CTRY EQ 'NZ' AND CASE EQ 'KBE' THEN DO;
  IYR = 9;
  IDT = 164;
  TVAL = 1700000;
END;
IF CTRY EQ 'N4' AND CASE EQ 'RAM' THEN DO;
  IYR = 7;
  IDT = 346;
  TVAL = 379146;
END;
IF CTRY EQ 'N4' AND CASE EQ 'RAM' THEN DO;
  IYR = 8;
  IDT = 310;
  TVAL = 380000;
END;
IF CTRY EQ 'N4' AND CASE EQ 'RAP' THEN DO;
  IYR = 9;
  IDT = 017;
  TVAL = 1300000;
END;
IF CTRY EQ 'PE' AND CASE EQ 'KBB' THEN DO;
  IYR = 7;
  IDT = 347;
  TVAL = 3290000;
END;
IF CTRY EQ 'PI' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT = 233;
  TVAL = 4002037;
END;
IF CTRY EQ 'PI' AND CASE EQ 'RAJ' THEN DO;
  IYR = 8;
  IDT = 039;
  TVAL = 3000000;
END;
IF CTRY EQ 'PI' AND CASE EQ 'RAK' THEN DO;
  IYR = 8;
  IDT = 039;
  TVAL = 900000;
END;
IF CTRY EQ 'PI' AND CASE EQ 'RAL' THEN DO;
  IYR = 8;
  IDT = 274;
  TVAL = 1709098;
END;
IF CTRY EQ 'PI' AND CASE EQ 'RAM' THEN DO;
  IYR = 9;
  IDT = 172;
  TVAL = 1650000;
```

```
IF CTRY EQ 'PK' AND CASE EQ 'KBH' THEN DO;
  IYR = 8;
  IDT = 265;
  TVAL = 10000000;
END;
IF CTRY EQ 'PT' AND CASE EQ 'RAJ' THEN DO;
  IYR = 8;
  IDT = 200;
  TVAL = 343704;
END;
IF CTRY EQ 'PT' AND CASE EQ 'RAK' THEN DO;
  IYR = 9;
  IDT = 139;
  TVAL = 653068;
END;
IF CTRY EQ 'SN' AND CASE EQ 'KBA' THEN DO;
  IYR = 9;
  IDT = 172;
  TVAL = 100000;
END;
IF CTRY EQ 'SR' AND CASE EQ 'KBG' THEN DO;
  IYR = 8;
  IDT = 227;
  TVAL = 23461737;
END;
IF CTRY EQ 'SU' AND CASE EQ 'KBB' THEN DO;
  IYR = 9;
  IDT = 260;
  TVAL = 3314155;
END;
IF CTRY EQ 'TH' AND CASE EQ 'KBB' THEN DO;
  IYR = 8;
  IDT = 045;
  TVAL = 7406653;
END;
IF CTRY EQ 'TH' AND CASE EQ 'KBC' THEN DO;
  IYR = 9;
  IDT = 136;
  TVAL = 10241125;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RAU' THEN DO;
  IYR = 8;
  IDT = 349;
  TVAL = 45803;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RAV' THEN DO;
  IYR = 8;
  IDT = 268;
  TVAL = 45803;
END;
```

```
IF CTRY EQ 'TH' AND CASE EQ 'RAW' THEN DO;
  IYR = 8;
  IDT = 268;
  TVAL = 55000;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RAZ' THEN DO;
  IYR = 9;
  IDT = 205;
  TVAL = 847630;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RBA' THEN DO;
  IYR = 9;
  IDT = 263;
  TVAL = 136149;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RBB' THEN DO;
  IYR = 9;
  IDT = 263;
  TVAL = 36390;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RBC' THEN DO;
  IYR = 9;
  IDT = 263;
  TVAL = 458031;
END;
IF CTRY EQ 'TH' AND CASE EQ 'RBD' THEN DO;
  IYR = 9;
  IDT = 263;
  TVAL = 1007670;
END;
IF CTRY EQ 'TU' AND CASE EQ 'RAC' THEN DO;
  IYR = 8;
  IDT = 194;
  TVAL = 150000;
END;
IF CTRY EQ 'TW' AND CASE EQ 'RBK' THEN DO;
  IYR = 8;
  IDT = 256;
  TVAL = 33800000;
END;
IF CTRY EQ 'TW' AND CASE EQ 'RBL' THEN DO;
  IYR = 9;
  IDT = 261;
  TVAL = 60000000;
END;
IF CTRY EQ 'UK' AND CASE EQ 'RBL' THEN DO;
  IYR = 7;
  IDT = 346;
  TVAL = 12030222;
END;
```

```
IF CTRY EQ 'UK' AND CASE EQ 'KBM' THEN DO;
  IYR = 8;
  IDT = 280;
  TVAL = 16500000;
END;
IF CTRY EQ 'UK' AND CASE EQ 'KBN' THEN DO;
  IYR = 8;
  IDT = 360;
  TVAL = 253222;
END;
IF CTRY EQ 'UK' AND CASE EQ 'KBP' THEN DO;
  IYR = 9;
  IDT = 264;
  TVAL = 24000000;
END;
IF CTRY EQ 'TK' AND CASE EQ 'KBC' THEN DO;
  IYR = 8;
  IDT = 181;
  TVAL = 17104194;
END;
IF CTRY EQ 'TK' AND CASE EQ 'KBD' THEN DO;
  IYR = 9;
  IDT = 215;
  TVAL = 25809970;
END;
IF CTRY EQ 'TK' AND CASE EQ 'RAF' THEN DO;
  IYR = 9;
  IDT = 22b;
  TVAL = 2723005;
END;
IF CTRY EQ 'VE' AND CASE EQ 'KBF' THEN DO;
  IYR = 8;
  IDT = 069;
  TVAL = 300000;
END;
IF CTRY EQ 'CO' OR CTRY EQ 'JO' OR
CTRY EQ 'NZ' OR CTRY EQ 'SR' OR
CTRY EQ 'ST' OR CTRY EQ 'MO' OR
CTRY EQ 'IN' OR CTRY EQ 'GR' OR
CTRY EQ 'MF' OR CTRY EQ 'AU' OR
CTRY EQ 'KS' OR CTRY EQ 'SU' OR
CTRY EQ 'TK' OR CTRY EQ 'IS' OR
CTRY EQ 'TH' OR CTRY EQ 'CW' OR
CTRY EQ 'PT' OR CTRY EQ 'CX' OR
CTRY EQ 'PI' OR CTRY EQ 'BR' OR
CTRY EQ 'N4' THEN DO;
CTYGP = 'TYPE1' ;
END;
```

```
IF CTRY EQ 'SN' OR CTRY EQ 'FR' OR
CTRY EQ 'EC' OR CTRY EQ 'NE' OR
CTRY EQ 'ID' OR CTRY EQ 'TW' OR
CTRY EQ 'TU' OR CTRY EQ 'PK' THEN DO;
CTYGP = 'TYPE2';
END;
IF CTRY EQ 'BE' OR CTRY EQ 'VE' OR
CTRY EQ 'EG' OR CTRY EQ 'NO' OR
CTRY EQ 'NE' OR CTRY EQ 'UK' OR
CTRY EQ 'PE' OR CTRY EQ 'AT' OR
CTRY EQ 'DE' OR CTRY EQ 'GY' OR
CTRY EQ 'JA' THEN DO;
CTYGP = 'TYPE3';
END;
IF R1 EQ 'A' OR R1 EQ 'B' THEN DO;
RIC = 'ARM';
END;
IF R1 EQ 'N' OR R1 EQ 'P' THEN DO;
RIC = 'NAV';
END;
IF R1 EQ 'M' THEN RIC = 'MAR';
IF R1 EQ 'G' THEN RIC = 'GSA';
IF R1 EQ 'S' THEN RIC = 'DLA';
IF YR LT IYR THEN DO;
YR = YR + 10;
YS = YS + 10;
END;
IF YS LT YR THEN DO;
YS = YS + 10;
END;
DTSP = SP + YS * 365;
DTRQ = RQ + YR * 365;
RDAYS = DTSP - DTRQ;
IF RDAYS LT 0 THEN DELETE;
IMPD = IDT + IYR * 365;
CDAZ = DTRQ - IMPD;
SDAZ = DTSP - IMPD;
IF SDAZ GT 1370 THEN DELETE;
ITR = (INT(RDAYS/91.25) + 1;
ITRS = (INT(SDAZ/91.25) + 1;
ITRQ = (INT(SDAZ/91.25) + 1;
PVAL = (VAL(PVAL;
PROC SORT DATA=CHUCK OUT=CKK;
BY CTRY;
PROC CHART DATA=CKK;
BY CTRY;
HBAR DTRQ / SUMVAR=PVAL
MIDPOINTS= -0.5 TO 14.5 BY 1.0;
```

```
PROC CHART;
 BY CITY;
 VBAR QTRS / SUMVAR=PVAL
 MIDPOINTS= -0.5 TO 14.5 BY 1.0;
PROC FREQ;
 BY CITY;
 VAR RDAYS SDAZ SDAZ;
PROC FREQ;
 VAR RIC DSC;
PROC SORT DATA=CHECK OUT=CHK;
 BY CITYGP RIC DSC;
PROC CHART DATA=CHK;
 BY CITYGP RIC;
 VBAR QTRO / SUMVAR=PVAL
 MIDPOINTS= -0.5 TO 14.5 BY 1.0;
PROC CHART;
 BY CITYGP RIC;
 VBAR QTRS / SUMVAR=PVAL
 MIDPOINTS= -0.5 TO 14.5 BY 1.0;
PROC CHART;
 BY CITYGP RIC DSC;
 VBAR QTRO / SUMVAR=PVAL
 MIDPOINTS= -0.5 TO 14.5 BY 1.0;
PROC CHART;
 BY CITYGP RIC DSC;
 VBAR QTRS / SUMVAR=PVAL
 MIDPOINTS= -0.5 TO 14.5 BY 1.0;
;;
```

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